ELECTRICAL REVIEW
AND
WESTERN ELECTRICIAN

VOL. LVII, No. 7. CHICAGO, SATURDAY, AUGUST 13, 1910. ISSUED WEEKLY.

BY THE
ELECTRICAL REVIEW PUBLISHING COMPANY
CHARLES W. PRICE, President and Treasurer.
A. A. GRAY, General Manager. H. S. TUTHILL, Secretary.
C. W. FORBRICH, Assistant Treasurer.

PUBLICATION OFFICE: MARQUETTE BUILDING, CHICAGO

EASTERN DEPARTMENT . . . . . 13 Park Row, New York.
E. E. Wood, Manager.
EUROPEAN OFFICE . . . . . 42 Old Broad Street, London, E. C.
Henry W. Hall, Manager.

CHARLES W. PRICE .....Editor-in-Chief
A. A. GRAY .....Managing Editor
MORTON GITHENS LLOYD .....Technical Editor
HENRY FARRINGTON .....Associate Editor
F. H. BERNHARD .....Associate Editor
HOWARD EHRLICH .....Associate Editor
C. H. SEAVER .....Associate Editor

SUBSCRIPTIONS.

One Year, United States	$3.00
One Year, Canada	4.00
One Year, Foreign Countries	6.00
Single Copy, 10 cents. Back numbers, beyond one month, each	.25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS 301
Commission News from New York 304
Michigan Electric Association Programme 304
Civil Service Examination 304
Louis A. Ferguson 305
Chicago Electric Club Annual Outing 306
Cleveland Electrical League Picnic 306
Denver Electric Show 306
Electric Automobiles in the United States Government Service 307
Storage Batteries in Army and Navy Service 310
New Hydroelectric Project Near Duluth 311
Industrial Accidents and Their Prevention 312
Indiana Electric Light Association 312
Electrical Notes from Great Britain 313
Pittsburg Land Show 314
Mechanical Properties of Insulating Compounds 314
Wisconsin Commission News 315
Westinghouse Buys Electric Line 315
American Society of Mechanical Engineers 316
A Unique Plant at Quincy, Ill. 318
High Tensions and Line Calculations 318
Electric Light System at Gary, Ind. 320
Conclave of Knights Templar in Chicago 321
Special Illumination in Syracuse 323
The Ethics of Central-Station Advertising 324
Sheboygan Electric Show 326
Boosting Brooklyn 327
New Electric Sign in Denver 328
Co-Operation Between Lamp Manufacturers and Central Station 328
New York Edison Company's Calendar 329
Big White Rock Water Sign 329
How to Get Undeveloped Central-Station Business 330
Signs in Massillon 330
Electricity in the Home 330
Electric Signs in Toronto 330
The Use of High-Frequency Currents for Sending Messages Over Power Transmission Lines 331
Wireless Telegraphy in New Zealand 331
Receiver for Telephone Company 331
The History of the Telephone 332
Armored Cable Laid in Chesapeake Bay 334
Electrification of Chesapeake & Ohio Northern Railroad Shops at Huntington, W. Va. 335
Electric Truck on the Farm 337
Two to Three-phase Transformation with Standard Transformers 337
An Electric Hot-Plate 337
QUESTIONS AND ANSWERS 338
AMONG THE CONTRACTORS AND SUPPLY MEN 339
FINANCIAL REPORTS OF ELECTRICAL COMPANIES 339
NEW ELECTRICAL AND MECHANICAL APPARATUS AND APPLIANCES 340
The Electric-Vehicle Situation in Ohio 346
Indiana Railroad Commission Issues Annual Report 346
CURRENT ELECTRICAL NEWS 347
DIRECTORY OF ELECTRICAL AND ALLIED ENGINEERING AND SCIENTIFIC SOCIETIES 353
RECORD OF ELECTRICAL PATENTS 354

Copyright 1910, by the Electrical Review Publishing Company.

PREVENTING INDUSTRIAL ACCIDENTS.

The danger to life and limb involved in the pursuit of industrial occupations is so great that the necessity of doing everything feasible to keep it within the narrowest possible limits is clearly evident.

Investigation into the causes of the many accidents has proved conclusively that a very large percentage of industrial accidents can be avoided by the adoption of proper preventive measures. From the nature of the case it is plain that, although the employer and employee must work together to attain the desired end of reducing accidents to a minimum, the initiative should come from the employer.

Accidents, of course, are due to a great variety of circumstances and combinations of circumstances—some unavoidable and many avoidable. Accidents due to defects of machinery and structures cannot be entirely prevented, for things will wear out or give way unexpectedly; however, they can be reduced very materially by frequent inspections and prompt repairs when they are necessary. Many manufacturers, also, invite accidents by allowing inferior machines, equipment and materials to be bought, thinking that such methods will reduce expenses. A big factor in the prevention of accidents is the purchasing of the best machines, equipment and materials obtainable.

It is unquestionable that numerous accidents are due to exposed gears. So many machines are operated, to some extent, by means of gears, that these, when unguarded, constitute a great menace. It is certainly preferable to provide safeguards for a machine while it is being built. This can be done at less cost and with less effort, and a great deal of the unguarded machinery now placed on the market would be guarded by the manufacturers if the buyers insisted upon it.

However, if machines are not thus provided, they can almost always be rendered comparatively harmless by means of home-made safeguards. In an article in a recent issue of *American Industries*, a brief abstract of which appears on other pages of this issue, the equipping of machines with home-made safeguards is treated in a concise and practical manner.

By a little effort on the part of the manufacturer, conditions in shops can be greatly improved and the toll of the lives of our workers greatly reduced.

MOMENTOUS RAILWAY PATENT DECISION.

A patent decision of the greatest moment to the electric railways of the country was handed down on July 28 in the United States Circuit Court for the Eastern District of Pennsylvania, and is referred to in our Legal Notes in this issue. A patent covering the system of operation used by practically all trolley and third-rail lines, issued originally to Mr. William M. Schlesinger, was sustained by the court. In addition to sustaining the patent, the court granted an injunction against the defendants restraining them from using any of the devices or apparatus covered by the patent.

On the face of the decree, it would appear necessary for the railway company, a Philadelphia street-car line, to suspend operations at once, and on the basis of this decision similar suits might be entered which would shut down nearly every electric road in the country. The particular company enjoined, however, is no longer an operating company, having leased its franchise and equipment to another company which controls the lines of the entire city. News advices do not state that the operation of the line in question has been interfered with.

The assessment of damages for infringement, however, is likely to be a serious blow to this company and to others; for, on the basis of this test suit, it is not to be doubted that similar decisions could be secured against other electric railway companies.

In view of the enormous interests at stake, it is to be expected that appeal will be taken to the Supreme Court of the United States.

THE ELECTRICAL EXPORTS FOR THE PAST FISCAL YEAR.

The totals of the electrical exports for the fiscal year ended June 30 last are now at hand and show an encouraging improvement over the preceding fiscal year. The total for 1909-10 is $14,742,395, which is an increase of $2,218,004 over the total for 1908-09. However, the total for 1907-08 was $15,249,436 and the total for the record fiscal year, 1906-07 was $17,268,406. This shows that we still have considerable to strive for before new record totals will be established.

On analysis of these totals into the sub-classes, electrical appliances and electrical machinery, it is found that the falling off from the banner year, 1906-07, is entirely in the exports of electrical machinery, which have steadily diminished year by year. On the other hand, the exports of electrical appliances, which include telephone and telegraph instruments, have received a marked impetus, their value during the past fiscal year, $8,694,132, being the highest figure ever attained in this line.

The chief reasons for this decided improvement in appliance exports are that they consist very largely of telephonic apparatus, in which this country leads, pre-eminently; the use of the telephone is rapidly extending over the whole world and it is but natural that this country should supply the bulk of the necessary equipment. In fact, as the superiority of American telephone apparatus is more widely appreciated, it is to be expected that our exports of electrical appliances will continue to increase at an even more rapid rate.

In the electrical machinery line, however, the very close competition of foreign manufacturers, particularly the Germans, combined with the slow progress of large electrical projects on account of unfavorable financial conditions, will probably retard the revival of the machinery exports to their high level of a few years ago. It is to be firmly hoped that the steady slump in these exports has reached its worst point and that the reliability and ruggedness of American electrical machinery will again restore it to its proper place in the markets of the world.

ELECTRICITY AS A CIVILIZING AGENT.

"There is one particular part of the State of Washington where but six years ago the traveler on railroad trains rode through miles of desolate-looking country. Today that same land is one long continuation of rich farms, loaded with all sorts of good things to eat, adorned with artistic houses and outbuildings, lighted with electricity; with pure water under pressure in abundance; with telephones, electric-car lines, splendid roads over which pass fast horses and faster automobiles—and it is all the result of but six years of development."

Thus spoke Mr. H. L. Moody, of Spokane, Washington, at the first annual dinner of the Chicago Irrigation Association, held at the La Salle Hotel, Chicago, on July 28 last.

It will be noticed that Mr. Moody gives direct credit to electricity for much of this splendid development. In a newly settled country, electrical transmission lines make possible a highly and quickly developed civilization, which would not otherwise be attainable in generations or even centuries. Without electricity one would have to revert to the most primitive forms of illumination, which are inefficient, insufficient, costly and unhealthy. Without the telephone and the electric railway the new country would be in loneliness like the wilderness of the poet Omar, and without irrigation, which nowadays is carried on in our great West largely by means of electric pumping, the desert would indeed be lacking the "jug of wine and the loaf of bread" instead of being covered with the fruits of the earth in great abundance.

It may truly be said that electricity is the greatest civilizer. When Colonel Roosevelt went on his hunting expedition to Africa, the outside world was surprized to hear that the British residents in East Africa lighted their houses and did many of the chores by electricity. And recently it was announced that the River Jordan is being harnessed to generate current to electrify—probably in more senses than one—the ancient land of Palestine. Since the Roman occu-

pation of this historic country, the inhabitants have retrograded under the misrule of many stronger overlords until the land is no longer "flowing with milk and honey," but is instead a poverty-stricken semiwilderness. With the advent of electricity a new era will begin and the example of the part of the State of Washington alluded to by Mr. Moody, and of other tracts in this country and other places, will doubtless be emulated. The ancient peoples of the East have given us some of our best traditional fairy tales—electricity will be the means of more than materializing them.

KNIGHTS TEMPLAR ILLUMINATION IN CHICAGO.

In connection with the Thirty-first Triennial Conclave of the Knights Templar, which was held during the present week, Chicago bedecked itself with a most gorgeous holiday raiment and worked out an illumination spectacle which for thoroughness and beauty it will be hard to excel.

In addition to a great number of set pieces in the form of emblems typical of the order of the Knights Templar set up in various places about the city, there were several arches carrying out special features of illumination. For half a dozen blocks along State Street there was a series of columns surmounted by illuminated balls and connected by foliated festoons interspersed with myriads of incandescent lamps. There was also a giant sign in the form of the Knights Templar escutcheon, or badge, in Grant Park, at the foot of Jackson Boulevard, which was indeed an object of wonder not only from a spectacular but from a construction viewpoint.

On other pages of this issue there are several illustrations and a description of some of the lighting features. In this connection it will not be out of place to call attention to one feature of illumination which did not help in attractiveness. This was the large number of flaming arc lamps, electric signs and brilliantly illuminated store windows which formed a back ground for a considerable distance along the illuminated Templar Way on State Street, which made the lighting on the columns and festoons of secondary importance in brilliance. It was noticeable that where lights had been subdued or altogether eliminated the beauty of the temporary illumination was marked. In the other instances it is the opinion of many that it was seriously marred.

OUR UNDEVELOPED POWER.

The Commissioner of Industrial and Labor Statistics of the State of Maine recently gathered a large amount of data with a view of finding the amount of unused water power in that state. The amount of this unused and available power was astounding. It was shown when the figures were compiled, that over 100,000 horsepower might be generated by installing hydroelectric machinery on these streams which are at present running free. These power sites are not all large, but are distributed over considerable of the area of the state and are of such size as to be applicable to medium-sized or small power projects. One hundred and four of these sites will develop fifty horsepower or less; the same number will develop between fifty and 200 horsepower; fifty-two will each generate between 200 and 9,000 horsepower and two are of 20,000-horsepower capacity. In the case of this state at least the possible coal famine of the future is already well provided for.

It is true that Maine is hardly a fair example of our undeveloped power resources, for it is a well-known fact that the state has, by reason of its mountain streams, a great amount of available power; but it is only one of several states in which data is being secured.

The Piedmont section of the states of North Carolina and South Carolina already has twenty-five per cent of its 400 textile mills driven by electric power secured from hydroelectric installations.

In one section of Georgia not over one hundred miles square there are fifty cotton and yarn mills driven by electric power. That part of our country known as the "old south" has with its many mills and factories been using only a small part of its power supply and it is estimated that in that section alone 2,000,000 additional horsepower may yet be developed.

New York State, seeing the need of a closer investigation into the waterpower conditions of the state, has commenced to gather information. This is being done by the State Water Supply Commission in conjunction with the United States Geological Survey. Stations for gauging the flow of streams tributary to the Hudson are to be established and investigation made as to the fluctuation of the water supply.

Perhaps because of its immense irrigation and power projects, the development of our water powers has often been considered by the public as a problem confined to the western part of our country. This is not the case, for it is a matter of importance in every state in the Union. Every state has more or less undeveloped waterpower, and it is probable that most of us would be a little surprized to find that the amount in many of them is so large. The above examples in the East were taken at random from the daily papers, and show that interest is being stimulated there and that considerable capital can be profitably invested in eastern power projects.

Such investigations as are being carried on in these and in other states are most timely. It is not necessary or advisable for the governing bodies of the various states to leave a study of this matter to the time when the end of the coal and oil supply is in sight. The better plan is to find the approximate amount of waterpower that can be developed and to remember that each site that is worked will leave a correspondingly large amount of fuel for future use.

As to the investigations that are being carried out, they can hardly fail to be productive of great good.

Commission News From New York.

The New York Public Service Commission, Second District, has authorized the Riverhead Electric Light Company to exercise a franchise granted by the town board of the town of Southampton for the furnishing of electric light for that town. The commission has also authorized this company to issue its five-year six-per-cent bonds to the amount of $5,000, proceeds to be used for the construction and equipping of a distributing line from its station at Riverhead to the village or lighting district of West Hampton Beach. The commission has also authorized this company to issue its seven-year six-per-cent bonds to the amount of $2,300, proceeds to be used for the purpose of purchasing and installing generating machinery and switchboard.

The commission has also authorized the Newburgh Light, Heat and Power Company to purchase an electric-lighting plant from Marian Borden Halliday, owned and operated by her in the town of Shawangunk, Ulster County. The commission has also authorized the Newburgh Light, Heat and Power Company to exercise rights and privileges granted by several towns and villages. The company is also authorized to begin construction under these franchises and erect a transmission line, capable of carrying 33,000 volts, from Forest Glen, in the town of Gardiner, in a southerly direction to the town of Shawangunk, to connect with the distribution lines in that town, then southerly and east of the village of Walden, and thence southwesterly to the village of Montgomery, and such other distribution lines as will enable the company to distribute and sell electricity in the territory in which it holds franchises. A $70,500 bond issue for the construction of the high-tension line between Montgomery and Forest Glen has been approved.

The commission has approved of the transfer by Clarence Mulkins to Carlton A. Graves, for the sum of $5,000, of the electrical plant and distributing system in the village of Walton, Delaware County.

The Ithaca-Auburn Power Company asks in a petition to the commission, that it may be allowed to enter into a contract for the construction of a third-rail system between Auburn and South Lansing.

The power company asks approval for the taking over and enlarging of a steam plant, generating electricity, from the Remington Salt Company on the shores of Cayuga Lake, and authority to issue $250,000 capital stock, execute a mortgage for $750,000 and issue $435,000 in five-per cent thirty-year bonds thereunder. The applicant company also desires approval for the carrying out of an unexpired eleven-year contract with the Ithaca Street Railway Company, which it has received from the Remington Salt Company for the furnishing of power to the railway company. This was stated to be worth in the neighborhood of $30,000 yearly.

From South Lansing to Ithaca the road is now an overhead trolley, which will be retained, and when the entire route is electrified, Manager Herbert A. Clark of the railroad company estimates that with the hourly service, including cars at night, the weekly passenger receipts will be increased at least $1,500.00 a week. Some of the increased revenue will be derived from travel by the 5,000 students of Cornell University and people from nearby towns who are interested in agricultural courses at the university.

For the furnishing of exhaust steam heat for the use in evaporation of the Remington Salt Company, the power company has entered into a thirty-year contract at the rate of $24,000 a year.

H. C. Mandeville, of Elmira, one of the present owners of the salt company's steam power generating plant, adduced testimony as to the valuation of it and the contracts which the salt company proposes to turn over to the power company.

The Fonda, Johnstown and Gloversville Railroad Company has filed with the commission its petition for leave to issue $463,000 in six-per cent bonds, the balance of its issue of $7,000,000 in first mortgage bonds which are authorized by the former Board of Railroad Commissioners on January 16, 1903. The New York Security and Trust Company is trustee under the mortgage.

The bonds are to be issued to pay off certain existing obligations other than mortgage construction bonds and other properties of the petitioner, and for the cost of constructing double tracking.

Michigan Electric Association Programme.

The following programme has been announced for the meeting of the Michigan Electric Association, to be held in Port Huron on August 16, 17 and 18.

On Tuesday evening at eight o'clock there will be addresses of welcome, the President's address and a general reception.

Wednesday morning:

"Boiler Room Practice," by H. F. Rosenkrans, Durand, and H. A. Chase, Hart; discussion by Messrs. Westover, Denman, Morrisey and others.

"Accounting for Central Stations in Small Towns," by F. B. Spencer, Cheboygan.

"Real Cost of Street Lighting," by F. R. Mistersky, Detroit.

"Baking Enamel by Electricity," by John Cavanaugh, Benton Harbor.

"Power-Factor of Welding Machines," A. S. Hatch, Cincinnati.

Wednesday Afternoon:

Boat ride, inspection of Diamond Crystal salt works. Dinner at Stag Island and moonlight ride on lake.

Thursday Morning:

"Flat Rates for Residence Lighting," R. S. Stewart, Detroit.

"Cost of High Efficiency Lighting," G. E. Westover, Cadillac.

"Maintenance of Meters in Small Towns," by R. M. Hemphill, Ann Arbor.

Informal discussion on tungsten lamps, Thos. Hinks, Mt. Clemens; C. W. Smith, Laperer; H. A. Fee, Adrian; Eber Arnold, Marine City.

Executive session and election of officers.

Thursday Afternoon:

Ball game—Detroit Edison vs. Port Huron Independents, and "Trip Around the World," via St. Clair tunnel and ferry.

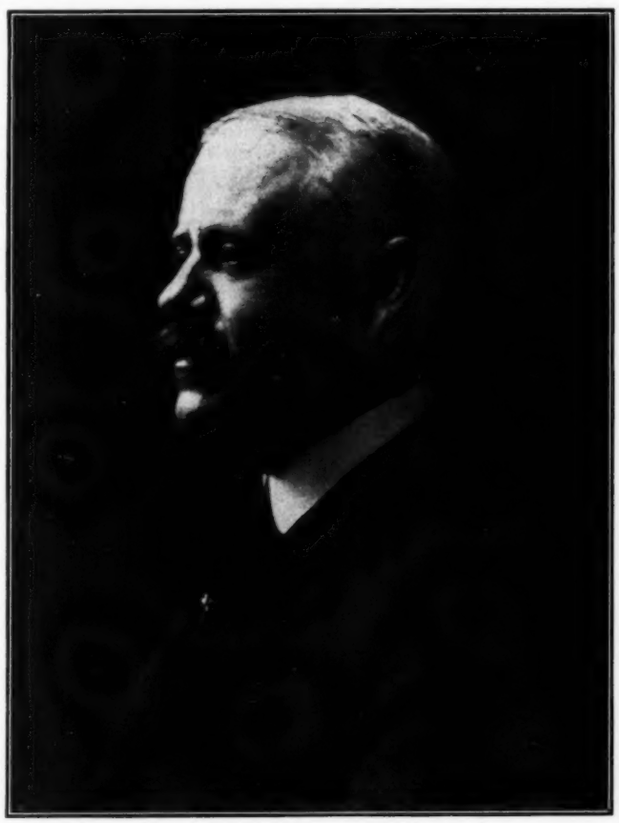
Civil Service Examination.

The United States Civil Service Commission announces that an examination will be held at the regular place, September 7 and 8, for the position of computer in the Coast and Geodetic Survey.

Those desiring to take this examination should apply to the United States Civil Service Commission, Washington, D. C., or to the secretary of any board of examiners for application Form 1312.

Louis A. Ferguson.

Upon the occasion of the Frontenac Convention of the American Institute of Electrical Engineers, for the first time in the history of the institution, the presiding officer was presented with a medal. The recipient of this unusual token of regard upon the part of the Board of Managers was Louis Aloysius Ferguson. Mr. Ferguson has exerted a broad influence upon the development of electrical engineering and central-station practice, particularly in regard to the commercial development of electric lighting. He has also exerted a marked influence over all those who have been intimately associated with him, and he ranks high in the esteem of his fellowmen.



LOUIS A. FERGUSON,
Vice-President of the Commonwealth Edison Company.

Louis Aloysius Ferguson was born in Dorchester, Mass., on August 19, 1867. He received his early education in the Boston public schools. He successfully passed his examination for entrance to the United States Military Academy at West Point, but his family induced him to abandon the plan of following a military career. He took up the study of electrical engineering at the Massachusetts Institute of Technology and his four years' course was brought to a conclusion with a thesis involving many original and novel experiments to determine the relation between candlepower, voltage and energy consumption in incandescent lamps. He was graduated from the Institute in 1888 with the degree of Bachelor of Science in Electrical Engineering.

He began his professional and business career by becoming associated with the underground distributing department of the Chicago Edison Company in 1888 and in 1890 was appointed electrical engineer.

In this capacity he had charge of all electrical engineering and operating work of the company. Three years later his duties were enlarged to include the supervision of all soliciting and contracting. In this connection he was particularly successful, negotiating a large number of long-time contracts with some of Chicago's greatest mercantile institutions. In 1897 he was appointed general superintendent of the Chicago Edison Company and a year later he was made general superintendent also of the Commonwealth Electric Company. In 1902 he was elected second vice-president of both companies and upon the consolidation of these companies under the name of the Commonwealth Edison Company in 1907 he was made second vice-president of the new corporation.

Mr. Ferguson has been connected with one of the most interesting developments which history has ever written concerning the central-station industry. As an operating engineer he has seen the magnificent institution with which he is connected grow from a matter of small belt-driven unit to an aggregation of the largest energy-producing machines the industrial world knows today. He has been intimately connected with and responsible for a great part of the development from low-tension feeder systems to the remarkable high-tension distribution and net work which the Commonwealth Edison Company now controls in its great territory.

Mr. Ferguson has been a valued contributor to the scientific and technical press of the country and his papers before such institutions as the National Electric Light Association, the American Institute of Electrical Engineers and the Association of Edison Illuminating Companies have been classical. He has been at the head of important committees for these organizations and has done much to standardize our practice in connection with the generation of current and illumination by incandescent lamps. He has also had a great deal to do with the development and utilization of the storage battery. He is an ardent advocate of the centralization of electrical supply and his annual address as president of the American Institute of Electrical Engineers at the Frontenac Convention was a notable memorial upon this subject. In addition to being president of the American Institute of Electrical Engineers he has also been honored by the presidency of the National Electric Light Association in 1902 and the presidency of the Association of Edison Illuminating Companies in 1901 and 1902.

Mr. Ferguson was married at Dorchester, Mass., on June 21, 1892, to Miss Martha Sargent Jenkins. He has a family of two sons and one daughter. He belongs to a number of Chicago clubs and to the Engineers' Club of New York. He has always taken a strong interest in civic matters and his rugged honesty and delightful personality have been of great service to the community of which he is an honored member.

Electric-Crane Opportunity.

A recent consular report states that $83,703 will shortly be expended on the purchase of electric cranes for river docks in a certain European country.

Particulars may be obtained by writing to the Bureau of Manufactures, Washington, quoting File No. 5284.

Chicago Electric Club Annual Outing.

The annual outing of the Chicago Electric Club was held at Ravinia Park, Ill., on Saturday, August 6. Promptly at 10:15 a. m., a special train of seven cars left Chicago with the party over the Chicago & Northwestern Railroad. The weather was perfect, and a delightful day was greatly enjoyed by several hundred members and guests.

The athletic contests were begun by a well-played and sharply contested baseball game between the married and single men, the former winning by a score of four to two. After luncheon there were a number of events including a ball-throwing contest for ladies, potato race for ladies, fifty-yard dash for ladies, 100-yard dash, three-legged race and fat men's race. Other contests included attendance guessing, bean guessing and guessing the names of twenty famous poets or authors from obscure suggestions. Over $250 worth of prizes were distributed, these being donated by representative electrical houses located in Chicago.

The schedule of games was well-arranged, each event being conducted with precision and fairness and the athletic committee was the recipient of many commendations.

After the games a band concert was given by the Walter Damrosch Orchestra. Then following dancing. This was one of the most pleasing features of the occasion, the floor being in fine condition and the club's own band rendering the best of music.

The committeeemen wore speciel decorations, and each lady was presented with a Japanese parasol. The members of the general committee, under the chairmanship of George H. Porter, covered themselves with glory by their skilful attention to details looking to the comfort and enjoyment of those in attendance. J. G. Pomeroy was an efficient umpire at the base-ball game, and W. S. Taussig was in his element as official starter for the athletic contests. R. M. Van Vleit was responsible in a large part for the large attendance.

The following is a summary of the prize winners, prizes and donors of the various prizes. The Illuminating Engineer Publishing Company offered a two-year subscription to the *Illuminating Engineer* as fourth prize in the 100-yard dash, and a two-year subscription to the *Electrical World* was offered as fourth prize in the fat men's race, but no record of these awards was checked in the official list and we regret our inability to announce at this time the winners of these prizes. A five-year subscription to *Popular Electricity* was likewise awarded to one of the members of the winning baseball team.

Attendance Guessing Contest.—1st—Mrs. C. B. Schmal, electric portable lamp, Electric Shop. 2nd—Miss Emma Johnson, electric toaster, Electric Appliance Company. 3rd—Mrs. F. W. McClement, Five-pound box Huyler's candy, Standard Underground Cable Company.

Bean Guessing Contest.—1st—Mrs. G. W. Cravens, electric portable lamp, Beardslee Chandelier Company. 2nd—Miss Anna Jones, electric flat iron, Manhattan Electric Supply Company. 3rd—Mrs. F. W. Lancaster, Five-pound box of candy, J. Lang Electric Company.

Ball Throwing Contest.—(Ladies)—1st—Miss Mildred Holland, electric fan, M. B. Austin & Company. 2nd—Miss Sharp, electric flat iron, Central Electric Company. 3rd—Mrs. Allison, electric curling iron, Guarantee Electric Company. 4th—Miss Ormsbee, $10.00 Holophane shades, Holophane Company.

Three-legged Race.—(Men)—1st—Fowzer and Shepherd, two electric shaving mugs, General Electric Company. 2nd—Vose and Rockwell, twelve Mazda lamps, Sunbeam Incandescent Lamp Company; twelve Mazda lamps, Bryan Marsh Company. 3rd—Stanton and Binder, leather wallet, Ridgeway Dynamo and Engine Company; leather wallet, Adams-Bagnall Electric Company.

Potato Race.—(Ladies)—1st—Mrs. W. H. Coleman, electric heating pad, H. W. Johns-Manville Company. 2nd—Mrs. H. Farrington, electric flat iron, Pacific Electric Heating Company. 3rd—Miss Frances Gene, Five-pound box candy, Cutler Hammer Manufacturing Company.

100-yard Dash.—(Men)—F. B. Duncan, coffee percolator, General Electric Company. 2nd—T. D. Montgomery, electric fan, Western Electric Company. 3rd—W. L. Grant, Gillette safety razor, Electrical Review Publishing Company. 4th———. 5th—G. A. Binder, subscription ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

Fifty-yard Dash.—(Ladies)—1st—Miss Mildred Holland, electric toaster, Westinghouse Electric and Manufacturing Company. 2nd—Mrs. C. B. Schmal, electric flat iron, Illinois Electric Company. 3rd—Mrs. V. A. Sweet, electric curling iron, Vulcan Electric Heating Company.

Fat Men's Race.—1st—L. C. Jones, electric fan, Sprague Electric Company. 2nd—Mr. Roberna, cigar lighter, General Electric Company. 3rd—George H. Porter, poker chips and card outfit, Electric Service Supplies Company.

Pomeroy Guessing Contest—1st—Mrs. Lena Taussig, electric toaster, Simplex Electric Heating Company. 2nd—Mrs. C. B. Schmal, electric flatiron, Illinois Electric Company. 3rd—Miss J. Gold, electric curling iron, Vulcan Electric Heating Company.

Ball Game.—R. N. Shepard, disk cigar lighter, General Electric Company. L. A. Bauman, electric soldering iron, Vulcan Electric Heating Company. F. P. Mayer, box of cigars, F. L. Perry. C. R. Hunt, fifty La Venda cigars, Albert Breitung. F. W. Fowser, books on Panama and batteries, Thos. G. Grier. A. A. Gray, automobile timer, Delta Star Electric Company. Mr. Listenwalter, two-year subscription ELECTRICAL REVIEW AND WESTERN ELECTRICIAN. H. T. Matthew, fifty El Lessero cigars, Donaldson & Iselt Cigar Company. J. G. Pomeroy, fifty El Lessero cigars, Donaldson & Iselt Cigar Company.

Hobble Skirt Race.—1st—Mrs. Kadie. 2nd—Mrs. C. B. Schmal.

Number Guessing Contest.—Miss Marjorie Lee, I. L. Quales, P. F. Hensel, G. W. Cravens, James Dolliver, R. Muller.

Cleveland Electrical League Picnic.

The first anniversary of the Cleveland Electrical League was celebrated by a picnic, which brought several hundred members and friends together in a harmony meeting. Business was forgotten and races, games and a tug of war were indulged in. A chicken dinner was served and was followed by "harmony" songs.

The Electrical League of Cleveland, though but a year old, is showing the strength which results when all interests join in the spirit of the motto, "All together, all the time, for everything electrical." The officers of the league are: G. E. Miller, president; E. E. Noble, vice-president; H. H. Cudmore, secretary and treasurer.

Denver Electric Show.

The members of the Colorado Electric Club have organized the Colorado Electric Club Exposition Company, which will give a show in the Auditorium at Denver from October 8 to October 15, inclusive.

The president of the company is H. L. Woolfenden, and C. F. Oehlmann is secretary and treasurer. The following have been appointed chairmen of committees: Walter F. Brown, committee on admissions; J. B. Griffith, committee on decorations; George A. Woolley, committee on sale of space; A. R. Hall, committee on prizes and awards; C. F. Oehlmann, committee on electric lighting; W. P. Carstarphen Jr., committee on novelties; John M. Connelly, committee on publicity; B. S. Manuel, committee on entertainment; W. J. Matthews, committee on transportation. The board of directors is made up of the above and F. W. Frueauff, who is vice-president.

A fixed schedule of prices for exhibit spaces has been adopted, and admission will be charged, twenty-five cents in the afternoon and fifty cents in the evening. Prizes and awards amounting to $500 will be offered by the club, as well as $300 in scholarships for students exhibiting original electrical apparatus.

Special lighting features will be installed, both inside and outside of the exhibition building. These will include a representation of sunrise on Pike's Peak and Franklin's kite.

Electric Automobiles in the United States Government Service.

Descriptions and Illustrations of Some Machines Made for Special Service.

BY WALDON FAWCETT.

The automobile has come to play a very important part in all the varied activities of our national government, and in a great majority of cases it is the electric motor car of one class or another which is the servitor of the federal authorities. Especially is this the case at the capital of the nation, where governmental utilization of the self-propelled vehicle has reached its highest development. At the White House and at the United States Capitol, in all the various executive departments and independent bureaus and scientific institutions and in the practical work of the American army and navy, as well as in the administrative routine of the military and naval service, the electrically operated automobile has come to rank as a distinct factor in the economic conduct of the public business.

SEARCHLIGHT ELECTRIC TRUCK AND TENDER CONSTRUCTED FOR UNITED STATES ARMY.

Various influences have inclined the federal officials to electric automobiles in preference to steam and gasoline cars, particularly for service at or near the headquarters of the government in the District of Columbia. Unquestionably, one of the most important considerations is that in the case of electric machines Uncle Sam virtually gets his propulsive power free of charge. At the Capitol, at all the large departmental buildings, at navy yards, etc., extensive electric plants are maintained and are in virtually continuous operation. To supply the current necessary for charging electric automobiles is, of course, an insignificant incidental, which cannot be said to entail any added expense. The miles of asphalt pavement to be found on all the principal highways at Washington afford added incentive for the use of electrics, and, finally, the government officials in most instances declare that it is their personal experience that electrics in the governmental service require fewer adjustments and repairs than the other classes of cars.

The electric automobiles in the government service may be divided into two general groups. The first, and least numerous, division is made up of runabouts and similar types, which are used principally for the conveyance of medical officers in the military and naval service or for duties embracing inspection work of one kind or another. In this category, too, are the electric phaeton at the White House and the novel passenger cars which are operated in the tunnel under Capitol Hill in order to quickly transport Senators and others from the office building annex to the Capitol building proper. These autos in the Capitol subway are unique in design. It is impracticable to turn the car around at the end of each trip, and consequently the autos are arranged with seats along the sides and the chauffeur's seat and lever in the middle of the car. The five-horsepower storage batteries with which these cars are equipped enable a speed of twelve miles per hour, even when the vehicles are in effect running backward and the drive wheels are in front.

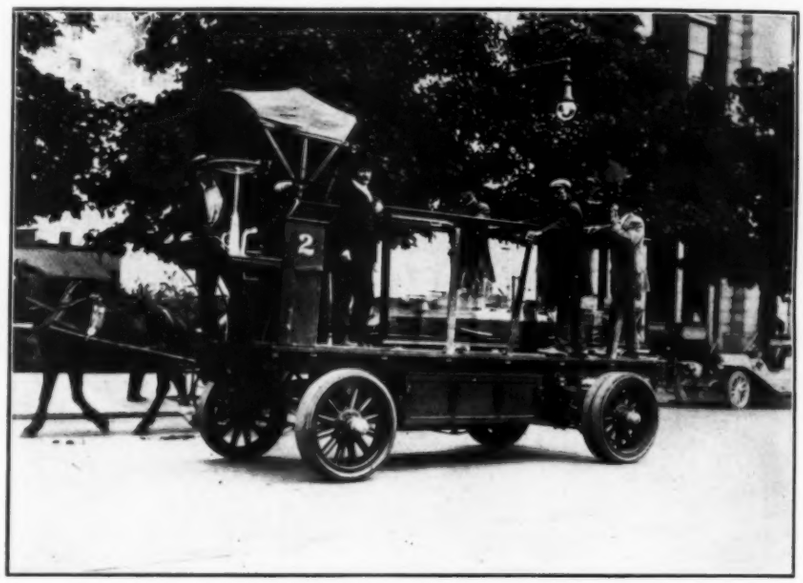
The second and more important class of electric automobiles in the government service is made up of commercial vehicles. Cars of this class are employed not only for freighting service of every description to and from government institutions of all kinds, but discharge important functions in the

great industrial plants maintained by the United States government. A notable case in point is afforded at the great naval gun factory in Washington, where four electric trucks are now in constant service, with a prospect of an increase in the number at no distant date. At this, the greatest ordnance manufactory of the kind in the world, the autos have displaced dozens of horse-drawn carts and wagons and there devolves upon them the entire responsibility for the transfer of all material through the plant as it progresses step by step from one building to another in the course of manufacture. Indeed, the scope of this transfer work embraces everything from rough castings to completed three-inch guns.

The autos at the naval gun factory also exemplify the possibilities of distinctive governmental design as applied to horseless commercial vehicles, and just here it may be added that almost all of the governmental atuomobiles have been specially constructed for the service for which they are intended, from designs prepared wholly or in part by government experts. The smallest of the gun factory trucks, known officially as No. 1, has a carrying capacity of 2,000 pounds and is capable of a speed of eighteen miles per hour, traveling thirty-five miles on one charge. Truck No. 2 is a Studebaker product of five tons' carrying capacity, and is designed for the heaviest class of work. A unique task assigned to this vehicle is the transportation to the Navy Department building or other destinations of the huge models of modern battleships which the government has constructed from time to time and the movement of which involves all the problems of bulk and weight, combined with that care essential to avoid the derangement of delicate parts.

A third truck at the naval gun factory is similar to the one just described, but has a carrying capacity of two tons instead of five. It was likewise constructed at the Studebaker plant, and will travel from thirty to thirty-five miles on one charge. Truck No. 4 is what might be termed a convertible car. Its capacity is 2,500 pounds and its speed of twenty miles per hour gives it advantages for certain lines of work. Once a week a top is placed on this auto and it becomes for the space of three hours or more an improvised "pay car." Fitted with desk and safe and in charge of three pay officers and several armed guards of the Marine Corps, the auto threads its way in and out of all the various buildings of the plant, there being disbursed a total of upward of $60,000 as the weekly wage of the 3,000 employes. The interior of the car is fitted with electric lights to facilitate work on dark days and there is an electric heater to contribute to the comfort of the pay staff on cold days.

One sphere of governmental administration in which the electric automobile has been responsible for an era of distinctly improved conditions is that which concerns itself with the transfer of package mail, express matter, etc. A representative example of the type of vehicle adapted for this service is seen in the new package and baggage wagon recently built for service at the White House by the Baker Company. The function of this particular car is to convey packages to and from the express offices, to transfer trunks and



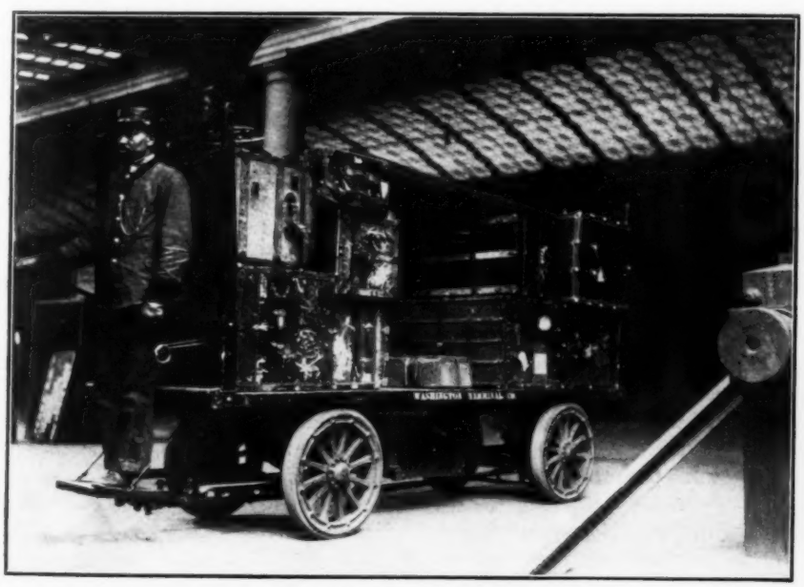
FIVE-TON TRUCK TRANSPORTING MODEL OF BATTLESHIP.

NEW ELECTRIC TRUCK OF BUREAU OF STANDARDS.

the presidential baggage in general between the White House and steamship wharves or railroad terminals and to handle parcels and bulk supplies as required for the executive offices. The electric vehicles in the government service is a truck just delivered to the Bureau of Standards, Department of Commerce and Labor. The testing laboratories of this unique government

AUTOMOBILE IN SUBWAY OF UNITED STATES CAPITOL.

auto has a pressed steel frame and a carrying capacity of 1,000 pounds. The wheel base is eighty-five inches and the tread fifty-six inches. It has a wheel steering gear and is capable of forty



ELECTRIC BAGGAGE TRUCK.

miles on one charge. The car has a 2.5-horsepower motor with 300 per cent overload capacity.

One of the most interesting of all the institution are located in the suburbs of Washington, purposely isolated from all steam and electric roads, and this new truck is necessary for general freighting and for the transportation of the heavy test specimens that will come to the bureau as the result of the recent installation of the most powerful testing apparatus in the world. The new truck, which was built by the General Vehicle Company of Long Island City, N. Y., is sixteen feet in length over all, weighs 8,830 pounds and has a carrying capacity of 3.5 tons. Indeed, on a recent test a load of 7,170 pounds of pipe and three men were transported on one charge a distance of more than thirty miles, at the conclusion of which the truck, loaded as indicated, climbed twice in quick succession an eleven per cent grade through heavy mud on a showing of 250 amperes.

This truck is fitted with a General Electric motor, with ball bearings, has a single motor drive, and is capable of forty miles, loaded, on normal city grades, on one charge. The freighting service at the bureau seldom exceeds a total of twenty-five miles in any one day, and in many instances it is necessary to recharge the batteries of the car only every other day. Distinctive features of the body of this car include the arrangement of the side boards (slat) in sections, so that any or all sections can be removed, and the provision of removable panels on either side of the operator's seat at the front of truck to facilitate the carrying of lengths of pipe, etc., which are thus enabled to extend beyond the body front and back. The Bureau of Standards has two other electric autos, the one a truck of 2,000 pounds carrying capacity, capable of forty-six miles on one charge, and the other a Waverley delivery wagon of 1,000 pounds carrying capacity.

The distinction of being the most remarkable military automobile in the world is claimed for a new electric car lately completed especially to the order of the War Department from designs prepared by officers of the Engineering Corps of the Army. This novelty is known as a searchlight motor truck and tender and its purpose, as may be surmised, is to transport to any scene of military operations one or more powerful searchlights and the equipment necessary for generating current for lighting. The distinctive feature of the truck is the provision of an electric motor for each of the four wheels, the power being applied direct to the periphery of the wheel. Each wheel is a driving wheel and all are steered simultaneously with one steering operation. Wheel casings are dust-

proof and sufficiently water-proof to allow the fording of streams.

Power is supplied to the motors and to the one or two large searchlights by generator, operated in turn by a gasoline engine. Electrical losses, found in many electric trucks, are claimed to be eliminated in this truck by the couple-gear transmission. The new truck has given an excellent account of itself in tests on ordinary and bad country roads and on one occasion was operated for twelve hours continuously. It has demonstrated its ability to alike operate on soft ground and to climb a twenty-five per cent grade. The truck has a speed of sixteen miles per hour. Each wheel has a band brake and there is also an electrical brake. The form of power generation and application exemplified in this new truck is to be adapted to various tasks in the military service. Already a pile driver has been ordered and the searchlight truck bids fair to prove the first of a most interesting series of electrical trucks for the various phases of army engineering work.

The electrical automobile ambulance has made a place for itself in both the military and naval service of the nation. When in ordinary service such an ambulance is fitted with long seats on either side and can carry twelve persons or more, but the long seats may be folded against the sides of the car and in the converted form the auto provides space for four litters, two being placed side by side on the floor and the other two above, in much the same position as upper berths in a sleeping car, but with pillar supports to insure stability. Electric automobiles have been employed successfully for the delivery of books from the Library of Congress to the homes and offices of officials and a kindred utilization which though not governmental is interesting is seen in the electric trunk trucks which are being introduced in the great railway terminals at Washington and New York. Each of these electric trucks has a carrying capacity of 4,800 pounds and will do the work of five or six hand-trucks in transferring baggage, mail, etc.

Indiarubber Imports.

The imports of indiarubber for the fiscal year 1910 were 101,000,000 pounds. This is an increase of more than 100 per cent in ten years.

STORAGE BATTERIES IN ARMY AND NAVY SERVICE.

BY E. L. REYNOLDS.

The Army and Navy, in diverse uses of electricity, have found occasion to adopt in one form or another, practically every electrical device known to the trade. It is, therefore, not surprising that the storage battery, which is used so extensively in modern applications of electricity, should have found a position of the greatest importance in the service. In view of this fact it is of interest to review some of the recent uses of the storage battery by our government, with a brief history, and some details of construction and operation.

The principle of the storage battery was discovered in 1801 by Gautherot, who experimented with platinum electrodes immersed in salt solution. Practically nothing was done to develop the principle until 1860 when Gaston Planté, a Frenchman, experimented with a cell consisting of lead strips immersed in dilute sulphuric acid. He discovered that each time the cell was charged and discharged, the amount of current given out on discharge was greater; and, further, that by charging the cell in reverse direction each alternate time, the capacity was rapidly increased. He amplified this process and was able to construct plates having sufficient capacity to make them a commercial possibility. Most changes and improvements of the storage battery since that time have been along these lines. Hence Planté is justly considered the inventor of the storage battery.

Planté's method of charge and discharge in reversed direction caused an increasing deposit of active material on the plates due to peroxidizing of the raw lead, thus resulting in an increase in capacity. This method of forming active material from the raw lead was slow and difficult and led to the experiments of Camille A. Faure, who, in 1881, patented a process of making storage batteries by covernig the lead surface with lead-oxide paste instead of forming the lead oxide electrochemically as in the Planté process. One charge only was then required to put the plates in condition to produce their final capacity. In the United States, Charles F. Brush developed, simultaneously with Faure, the same process, so that in this country Brush is considered the inventor and his patents controlled the process in America.

All lead storage batteries are today produced by one or both of these processes, so that they are of the Planté type, of the Faure type or of a combination of both types, in which case one plate, usually the positive, is Planté and the other Faure. Storage battery practice of today has, therefore, evolved through continuous mechanical and chemical improvements from the plates originally made by Planté and Faure.

The commercial use of storage batteries in this country on a large scale began about the year 1893 when the Electric Storage Battery Company, after five years' research, placed the chloride accumulator on the market. This company secured control of many of the patents of the storage battery art. From this time on storage batteries came into greater and greater use, the most noticeable applications at first being in connection with isolated electric plants, Edison lighting systems and electric street railways.

In 1896 the Edison Electric Illuminating Company, of Boston, installed a battery of 8,000 amperes. This was the first big step in the use of storage batteries on an extremely large scale. Since then most of the larger Edison plants throughout the country have installed enormous batteries so that at present date there are 165 such plants operating, aggregating 215,000 kilowatt-hours. The use of large batteries in isolated plants and street-railway plants has developed simultaneously so that there are now in operation approximately 1,200 such plants, aggregating 400,000 kilowatt-hours.

The most prominent installation of batteries to date is that of the New York Central and Hudson River Railroad, which company is now operating or installing 2,692 cells in nine batteries, aggregating 60,000 horsepower-hours at the regulating rate, in connection with the electrification of the steam road in New York city and vicinity.

The latest extensive use of storage batteries in government service is in the Navy, where the night sights are operated and guns fired by electric current. For several years dry primary batteries have been used for this purpose. A small galvanized iron box is fastened to the gun mount and in this

the dry cells are placed. After experimenting with storage cells in the recent cruise around the world, it was demonstrated that they meet conditions better than the dry cells. The care of the storage batteries, as will be seen later, is comparatively simple, and with this care the cells are always in a condition to instantly respond to demands upon them. A capacity of over twenty ampere-hours at ten volts could be squeezed into the small galvanized iron boxes—which capacity is ample to meet the requirements for several days under the most exacting conditions. As a result of observation of storage cells during the world's cruise and other data available, a storage battery was designed especially for this work, and a routine of operation carefully worked out. Last year over one thousand of these batteries were placed in service. In the construction the following points were determined to be advisable.

Plates are of the well known Exide type, grouped together with a substantial pillar strap and separated by grooved wood separators properly treated to remove all injurious substances. These plates are mounted in rubber jars and supported by ribs in the bottom of jar. Each cell is covered with a rubber cover supplied with a suitable vent and filling plug and having holes for exit of terminal plugs. Vents provide for return of condensed spray at vent openings. The five cells constituting the set are mounted in one wooden box of the following maximum outside dimensions: length eight and three-eighth inches, width seven inches, depth seven and seven-sixteenth inches to top of vent plug and terminals. The jars are placed in the wooden case and embedded in a suitable compound to make them integral with the case and prevent water or other liquid running down between the cells and the case. Four intermediate connection straps are burned to the projecting terminal posts of the cells, connecting them in series and the entire top is filled in flush with the top of the case with waterproof insulating compound, leaving only the two end terminals and the vent-plug extending above the even surface of the compound. The terminal posts are supplied with lead-alloy-encased connector clamps, each terminal post being provided with a square projection to receive square recesses in the terminal cable lug. A cut away section of a battery similar to this but with fewer cells is shown in Fig. 1.

The storage battery has made the submarine possible. There are now approximately twenty-five of these boats in service in the Navy and this number will undoubtedly be increased. The plate generally used is of the Exide type—a pasted plate similar to that in the gun-firing batteries, but much larger and heavier. The usual battery consists of sixty to 120 cells with discharge capacity from 500 to 900 amperes. The necessity of obtaining as much capacity as possible with minimum weight and space, has been well met by the storage batteries in service, and the details of installation, insulation, drainage, ventilation, have been so developed as to reflect the greatest credit upon all concerned in the design.

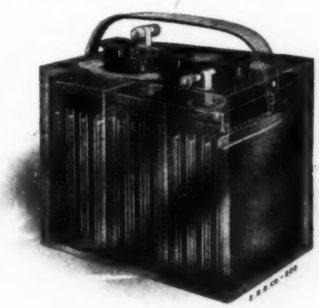


FIG. 1.—SHOWING INTERIOR OF BATTERY.

In the Army storage batteries have for many years been used in various fortifications as a reserve to the lighting plant. These batteries consist usually of sixty-four cells to operate on a direct-current 110-volt system. It would seem difficult to exaggerate the importance of these fortification batteries. In time of engagement their serviceability in case of accident to the generating plant would enable light to be obtained, thus ensuring the full fighting efficiency of the fort. Storage batteries in this work are of additional value in carrying the load when this load is too small to be economically carried on the generating plant, which results in considerable saving in fuel and labor. In some cases it has been found necessary to operate the generators only once a week, the storage batteries taking care of the load the rest of the time. It is thus seen that the economic and emergency features are of great value.

That the element of insurance of service is appreciated by others than the Army is shown by the fact that practically every great Edison Lighting Company of the United States has installed enormous batteries. The investment in storage batteries in the New York Edison service alone is considerably past the million dollar mark, and shows what the business man and engineer is willing to pay for insurance of service. Of course, the fortification batteries are small compared with these but their usefulness in time of war could not be valued in money.

The Army also has found large use for batteries in connection with telautograph machines at various fortifications. It seems that these electrical devices, which reproduce written instructions at distant points, demand a more constant voltage than that found in the average generating plant. Storage batteries are absolutely constant in voltage from moment to moment, and have been installed in great numbers for this work.

The field wireless outfit for the Army demands a storage battery for most efficient operation. For this purpose many portable batteries similar to the gun-firing batteries of the Navy have been placed in operation. These batteries have a capacity of sixty ampere-hours at eight volts, they weigh forty-seven and one-half pounds and in size are 12.6 inches long, 6.4 inches wide, and nine inches high.

New Hydroelectric Project Near Duluth.

The first permit for the development of waterpower sites on the public domain issued by President Taft's administration has just been granted to the Minnesota Canal and Power Company. It is a revocable license authorizing the use of public lands in the Birch Lake drainage basin in the Duluth, Minn., land district for power purposes.

This new project contemplates the development of more than 30,000 horsepower in the immediate vicinity of Duluth. The waters are to be stored in large reservoirs in the neighborhood of Ely, Minn. The diversion of the waters so stored and contributed by way of the St. Louis River, together with the water supplied by the river itself, will be used for the development of electrical energy, and a power house is to be built for this purpose.

Industrial Accidents and Their Prevention.

In an article on the safeguarding of gears, in a recent issue of *American Industries*, describing and illustrating effective devices for reducing to the minimum the dangers of operating machinery, the author says that almost all whoever comes close to gearing in motion is apt to suffer serious consequences. Gears are usually driven with great power and often at a high rate of speed, and anything caught in them cannot be withdrawn without injury. If a man's sleeve, for instance, should be caught in gears revolving at any considerable rate of speed, his arm would inevitably follow the sleeve.

Gears that mesh inwardly are especially dangerous, but all gears have a sufficient element of danger attaching to their operation to require that they be effectually guarded, whenever this can be done without positively interfering with the working of the machine. A great deal of the machinery being manufactured nowadays is equipped with gear-protecting devices, but gears not so protected can almost always be rendered comparatively harmless by means of home-made safeguards. If a metal covering is not easily obtainable, a wooden one will often serve the purpose, and either may be so constructed that it can be lifted off the gears when it is necessary to examine or oil them, or enough of the covering can be raised or removed. Such a safeguard will prevent many a serious accident, and it will require but little trouble and expense to supply it. When in position it protects fully against the dangers of the gears, and the fact that it can be removed, raised or opened, when necessary, does away with the objection that it might interfere with the work of keeping the gears in order and running smoothly. Where a dangerous pinion is so situated that a guard cannot well be attached to the machine-frame, and protection supported from the floor is not feasible, the meshing part can often be protected by mounting in front of it, and on the same spindle, a disc of sheet metal larger than the pinion.

The overhead gearing used for transmitting power from the prime mover to various parts of the factory should always be amply guarded when it is situated low, and high elevated gearing should be guarded, for a sufficient distance on either side at points that may require to be approached, by means of metal tubes or U- or V-shaped metal or wood shields, or the permanent platform system should be used. In either case the meshing sides of all toothed wheels should be protected by a cover.

Where the platform system is used, the platform, which is suspended from the ceiling and which can be made of either metal or wood, should have railings on both sides, the one nearest the moving parts, being kept sufficiently clear of wheels, pulleys and belts to prevent a workman being caught by them. Where overhead shafting is situated low enough to be within the reach of people on the floor, it should always be fenced in. Such shafting can be guarded by a U- or V-shaped trough, supported by straps from the ceiling.

It has been stated very frequently that it is impracticable to use guards on a rip saw. One will be told that guards have been placed on the saws, but that the men will not use them, and that they take them off. Yet in some shops every rip saw is provided with a guard, and it has been proved that the guard does not retard the work and that it is not an inconvenience to the operator.

If this is the case in one shop, why not in another shop? The question resolves itself into this: In one case, guards are provided and the owner or manager of the shop insists on their being used for the protection of the operators; in the other case, the owner is indifferent to the safety of his men. He either does not furnish the guards, or, if he does provide them, is not insistent on their use. One employer appreciates his responsibility to his employee and takes reasonable precautions to safeguard him from injury. What is said regarding the rip saw applies to all other dangerous machinery. If there is a willingness and a desire, on the part of those responsible, to provide safeguards for everything of a dangerous character, then proper safeguards will be forthcoming.

Notwithstanding all the precautions taken, accidents will happen. When one does occur, it should be immediately reported and thoroughly investigated. Knowledge of exactly how one accident happened will help prevention of others of like nature. Foremen of departments doing similar work should be fully informed of the nature of accidents.

INDIANA ELECTRIC LIGHT ASSOCIATION.

PROGRAMME OF INDIANAPOLIS CONVENTION.

The second annual convention of the Indiana Electric Light Association will be held at the Denison Hotel, Indianapolis, Ind., August 17 and 18.

The official programme is as follows:

WEDNESDAY, AUGUST 17.

The morning session will be opened with a roll call, after which the minutes of the previous meeting will be read. This will be followed by the address of the president and the report of the secretary.

The following papers will then come up for discussion:

Relation of Central Lighting Stations to Supply Houses. Gordon E. Varney, Indianaplis, Ind.

Commercial Value of Low-Head Water Power. F. A. Bryan, South Bend, Ind.

Relation of Purdue University to Electric Public-Service Companies of Indiana. C. Francis Harding, Lafayette, Ind.

The Cost of Light. Engineering Department, National Electric Lamp Association.

Ornamental Street Lighting. E. Darrow, Indianapolis, Ind.

Municipal Ownership in Indiana. R. A. MacGregor, Connersville, Ind.

The session will close with the appointment of committees.

THURSDAY, AUGUST 18.

Methods of Introducing Current-Consuming Devices. J. K. McDonough, General Electric Company.

Address. Charles A. Bookwalter, Indianapolis, Ind.

New Developments in Heating Devices. W. F. Hadaway, Westinghouse Electric and Manufacturing Company.

State Supervision of Public Utilities. Thomas C. McReynolds, Kokomo, Ind.

Feeder and Generator Regulators. F. W. Shackelford, General Electric Company.

Steam-Heating Construction. G. M. Williams, Indianapolis, Ind.

Following the reading of the papers, the "Question Box" will be opened and such questions as have occurred to members will be discussed. The meeting will close with the reports of the various committees and the election of officers. J. V. Zartman, of Indianapolis, is secretary of the Association.

Electrical Notes From Great Britain.

By Our British Correspondent.

The report issued by the Victoria Falls & Transvaal Power Company tells of a big demand for electric power for the mining industry of the Witwatersrand. There has been an especially important mining activity within the Brakpan area and a large extension of the overhead network is being made to supply the Brakpan mines, Cloverfield mines, Geduld Proprietary mines, Modderfontein B. gold mines, Modderfontein Deep, Modder Leases, New Modderfontein Gold Mining Company, Rand collieries, Springs mines, and Van Ryn Deep. These and other contracts have necessitated big additions to generating-plant capacity at the several stations, so that when erected the total plant capacity will be 155,100 horsepower, with a further 16,000 horsepower in steam-turbine-driven air-compressors, and will enable a supply of 500,000,000 kilowatt-hours per annum to be given, with sufficient reserve plant also available. The Marquis of Winchester, when placing an exhaustive report regarding the company's doings before stockholders of a meeting held in London on July 15, dwelt upon the important part that the provision of cheap electric power was going to play in attracting additional industries to the Transvaal, speaking also in the same connection of the large saving of capital expenditure to mining companies, as well as the reduction of working costs at the prices at which the company had undertaken to supply power in bulk, as compared with generation at individual mines. In the case of the City Deep mine, he said the saving in capital was $620,000 in favor of "purchasing," assuming the monthly capacity to be 65,000 tons; this is equivalent to $9,500 per 1,000 tons monthly capacity. In works cost the saving was estimated to range from twelve to twenty-four cents per ton, crushed.

Wolverhampton Corporation electricity department increased its output of energy by twenty-six per cent during the past year, owing to the demand for factory power. The policy of charging power users a low figure is amply justified there, it having resulted in the attraction of new industries to the town, which the financial position of the undertaking with a net profit of $26,000 for the year after meeting interest and loan charges is regarded as satisfactory. In keeping with the continued march of economy, the boiler-house plant is to be altered, certain proposed improvements promising a saving in fuel, labor and repairs of $2,000 per annum. The corporation refuse destructor is to be extended by the addition of further boiler and condensing plant and a 500-kilowatt rotary converter, and the transfer of some generating sets to the destructor, these alterations increasing the annual output from a million to a million and a half kilowatt-hours. Wolverhampton finds the reduction in revenue due to the metallic-filament lamp a much less serious matter than it was about a year ago.

Ilford's municipal electricity works have turned an annual loss of $1,500 into a profit of $7,810 mainly because of a big saving in coal consequent upon an alteration in the machine stokers, enabling a cheaper fuel and less labor to be used. The Leeds electricity accounts show that the gross receipts fell by $25,000, owing to metal-filament lamps, but working expenses were reduced and the output of energy was practically the same as in the previous year, an additional 750,000 kilowatt-hours for power compensating for the lamp drop. Sheffield Corporation shows a good increase in power revenue, but a bigger decrease in lighting, owing to the same cause—power increased from $94,455 to $117,420; lighting decreased from $265,585 to $231,320. It is stated that at Wakefield the municipal supply has made a loss of $10,000, against one of $4,000 in the previous year, for the same reason. At a cost of close upon $100,000, the Islington Borough Council is going to extend its high-tension feeders to four areas in its district in order to bring the loading down to a safe figure and to meet probable increase in demand. The borough electrical engineer, William Gay, made the proposition, but the council referred it to Sir Alexander Kennedy, who now says the expenditure is absolutely necessary. In order to comply with the factory and workshop regulations, Islington has also to spend $15,000 on a new main switchboard for its station.

A few months ago a brief description was given in these pages of the turbo-electric locomotive which had been constructing at the North British Locomotive Works in Scotland according to the Reid-Ramsey designs. We then stated that it was hoped that the locomotive would shortly be put into experimental running on a section of main line railway and comparisons with ordinary steam locomotion would be made. The new turbo-electric engine has now made a successful run from Glasgow to Gartsherrie, on the Caledonian & North British lines. It will be remembered that the Heilmann attempt in this direction dates back some sixteen or seventeen years, and the wonderful development of the turbine that has taken place in the years that have elapsed since then have made all the difference in the commercial and engineering practicability of the idea. Hugh Reid's present attempt bids fair to excite great interest among electrical and railway men everywhere.

We have on several occasions touched upon the very interesting work that Dr. F. W. Alexander, the medical officer of health at Poplar, London, has been engaged upon for the past four years in supplying electrolytic disinfecting fluid from a small installation set up by him in connection with the public health department of his borough.

His annual report concerning the past year's working has just been issued, and it shows that the demand for the fluid was so great that at times it could not be met. In the "intensely hot weather" the stability of the fluid was good, which speaks well for the method employed. The total distribution from the seven depots was 27,216 gallons, the cost of the materials—chloride of magnesium, salt, caustic soda, and water, also 4,781 kilowatt-hours of electricity at three cents a kilowatt-hour—being $258.12; bottles, corks and labels costing about $190. Dr. Alexander says that, after working for nearly four years and not having been cleaned for over twelve months, the apparatus was taken to pieces and overhauled. The platinum wire and slates upon which it is wound were

found in perfect condition. These are the positive electrodes and are the costly portion of the plant. In the apparatus there are forty pairs of zinc plates (negative electrodes) and experience shows that these last from four to five years. The cost of a pair of electrodes with nuts and bolts is $1.30. It is found that by slightly altering the shape of the zinc electrodes their lives may be considerably increased and give greater working efficiency to the plant. The report gave particulars of the new plant that had been added during the early part of 1910. It comprises four electrolyzers for an output of twenty-five gallons of fluid at a strength of four grams of chlorine per liter and suited for a 240-volt circuit.

The containing tanks are made of earthenware, which, if well glazed, will never wear out. "Earthenware is one of the best insulating materials. Tanks made of slate contain iron (it seems impossible to obtain slate free from iron) and were being constantly destroyed by the action of the electric current and had to be often replaced." With a current of twenty-five amperes, over six grams of chlorine per liter are obtained. This efficiency is stated to be doubtless due to the new shape of the electrodes and to the earthenware tanks.

The resistance offered by the electric light and railway companies of the metropolitan district to the striking out of the word "black" from the clause in the act relating to smoke nuisance has been successful. They were able to produce valuable evidence from coal suppliers showing the trouble to which electrical companies went in selecting suitable fuels, setting up special fuel-testing laboratories, which were conducted at considerable expense; the care which was sometimes taken by themselves in watching their own chimneys so as to warn stokers the moment the smoke appeared to become excessive; the smoke-prevention work that they were doing by inducing factory owners to abandon their isolated plants, which made smoke of their own, and use electricity for driving; the money expended upon altering equipments, preventing smoke as far as possible; and showing that it was practically impossible to prevent even black smoke when a peak load came on through sudden darkness or storm.

The trackless-trolley system continues to attract attention among English tramway authorities. A report in its favor has now been made by the general manager of the Plymouth municipal tramways. Two corporations, Leeds and Bradford, have secured parliamentary powers to run such cars, and among the cities which have sent deputations to the continent to study the question are Dundee, Manchester, Liverpool, Sheffield and Newcastle. In all cases their reports have favored the adoption of the system in England. In his very interesting paper read at the Dublin Tramway Congress, Harry England expressed the view which many appear to hold, namely, that as things are the economic limit of tramways has been almost reached in provincial districts in the United Kingdom.

Where the motor omnibuses have been tried as feeders they have been eventually abandoned, for the simple reason that the traffic they have brought to the tramways has been more than counterbalanced by the loss on their own working. One of the principal difficulties in the way of the installation of the new system in England is the cost of securing parliamentary sanction. As the Board of Trade is understood to look with a certain amount of favor on trackless-trolley proposals, it has been suggested that it might facilitate their carrying out by granting licenses, avoiding the setting to work of heavy parliamentary machinery for so small a purpose.

ALBERT H. BRIDGE.

London, July 30, 1910.

Pittsburg Land Show.

Arrangements are being made for a mammoth land show, to be held in Pittsburg, Pa., October 17 to 29. The object of the exposition is to provide information to the farmer, the homeseeker, and investor regarding land openings and developments in all sections of the country, and to show samples of the mineral, agricultural, horticultural and botanical products of the soil, and to teach the students and laymen educational facts concerning land reclamation and irrigation.

The exhibits will include those of the United States and state governments, boards of trade, chambers of commerce, commercial bodies, land and irrigation companies.

MECHANICAL PROPERTIES OF INSULATING COMPOUNDS.[1]

BY R. W. ATKINSON.

Those mechanical properties of insulating materials which will be discussed are very closely related—brittleness, saturation or penetration when hot, flowing when cold and viscosity. In fact the last term includes all the others.

It is these properties which largely determine the usefulness of insulating materials, there being much more uniformity in electrical properties. In order to compare viscosities quantitatively it is necessary to define viscosity. In absolute terms viscosity is equal to the tangential force per unit area divided by the shear per unit time. The definition is somewhat similar to that of the modulus of elasticity for elastic materials. Viscosity is equal to the stress divided by the rate of strain.

Now, in many compounds the viscosity is different for different stresses. It is well known that many hard or even brittle materials will flow if given time. I have demonstrated the characteristic properties of three typical compounds by filling three boxes at the same time. When they were cool a small screw was laid on each. The first is very hard and brittle, but the screw has penetrated a considerable distance; the second is softer, but still brittle and the screw has sunk a long way; the third is much the softest and absolutely not brittle, but the screw has merely made a mark.

In general, a compound which, when apparently fairly hard, will flow in that manner, is always brittle. The converse is also true. The brittle, flowing compounds are much more affected by temperature changes than are the others.

For measuring the viscosity at and above the melting point some form of the Doolittle viscosimeter is best used. It consists essentially of a torsion pendulum which twists a metal cylinder in the compound. The pendulum is allowed to swing and is retarded by the compound. The number of degrees of retardation divided by the total number swung through is a measure of the

1 Paper presented at a meeting of the Pittsburg Section, American Institute of Electrical Engineers.

viscosity and is proportional to the absolute viscosity. Measurements with this apparatus furnish data concerning saturation, penetration, etc.

Perhaps more interesting is the measurement of viscosities below the melting point. Here use is made of a special orifice viscosimeter. Means is provided for forcing the material through the hole by means of air pressure up to 300 pounds per square inch. Provision is made for controlling and measuring the temperature as well as the pressure. The viscosity is proportional to the pressure required to force out the compound at a definite rate.

Here is furnished the explanation of the conduct of the brittle, flowing compound (to be called class A). It is found that the viscosity of this class of compound is not affected by pressure. It will flow only ten times as fast at 100 pounds pressure as it will at ten pounds per square inch. Within the limits of the apparatus the rate of flow is very closely proportional to the pressure. The non-brittle, non-flowing class (to be called class B) behaves differently. Some of them would flow 100, others 1,000, or even 10,000 times as fast at 100 pounds as at ten pounds and that many times as fast at ten pounds as at one pound pressure. That is to say very rapid motion can be produced by a moderate force and conversely a blow producing extremely rapid motion will produce only a moderate force and no tendency to rupture, whereas the same rapid motion of class A compounds would require a large force—sufficient for cracking or even shattering. On the other hand a very slight force will in a moderate length of time cause those of class A to flow while not affecting those of class B.

It is desired to call attention to the variation of viscosity with temperature. The viscosity may change by ten times its original value for a change in temperature of from twenty degrees to one hundred degrees Fahrenheit, one hundred times in twice that number of degrees, and can be measured from less than one to more than one million.

The first reason for making these measurements is to compare compounds made of different materials or by different manufacturers. When it is once determined what are the desirable characteristics for a given service by experiments on one compound any other can be compared with it by use of the one set of tests. In this way very elaborate tests can be made to determine just what characteristics are necessary for any result. For example, it may be found that a compound with viscosity one at a certain temperature will saturate a certain thickness of paper in a given time at that temperature. It is unnecessary then to make saturation tests on other similar compounds.

A second reason is to determine more accurately the effects of mixing different compounds; and not least is the maintenance of permanent standards. Had one not had the same experience when making guesses, oneself, it would be amusing to see the mistakes made by experienced practical men in trying to recognize the old standard compound that they have made and handled for years.

Wisconsin Commission News.

The Menominee and Marinette Light and Traction Company has submitted a schedule of rates for electric light and power for the approval of the commission. The company wishes to reduce its primary rate for lighting from thirteen to eleven cents; the secondary rate from eight to seven cents, and the excess rate from four and one-half to four cents. The power rates suggested by the company consist of a service charge of fifty cents per month per horsepower, with a current charge scaled according to the size of the installation, beginning with a rate of three and one-half cents, for installations of twenty horsepower or less, and dropping to three-quarters of a cent for installations of over 500 horsepower. The commission stated in connection with the power schedule proposed by the company that, "While the proposed rates are, in fact, material reductions, the objection can well be made that the proposed schedule fails to recognize the fundamental principle that rates should be based on the demand as well as connected load. There is nothing to prevent a consumer with an installation larger than another consumer and who uses less current than the latter from receiving a cheaper rate per kilowatt-hour consumed." The commission recommends a power schedule worked out on the same lines as laid down by the commission in the Madison Gas and Electric decision. The company gave as its reason for reducing rates the fact that its water-power plant will soon be in operation.

In its decision after an investigation of the rates charged by the Chippewa Falls Water Works and Lighting Company, the commission ordered the following rate schedule into effect: Primary rate, thirteen cents per kilowatt-hour for energy used equivalent to, or less than, the first thirty hours' use per month of the active connected load. Secondary rate, eight cents per kilowatt-hour for additional energy used equivalent to, or less than, the next sixty hours' use per month of the active connected load. Excess rate, five cents per kilowatt-hour for all energy used in excess of the above ninety hours' use per month of the active connected load.

In Class A, consisting of residences, flats and private rooming houses where the total connected load is equal to or less than 500 watts nominal rated capacity, sixty per cent of the total connected load shall be deemed active; where the installation exceeds the above value, one-third of that part of the total connected load over and above 500 watts shall be deemed active.

Class B consists of stores, saloons, theaters, depots, halls, banks, etc. In this class eighty per cent of the total connected load is deemed active except such portion used for signs, window and showcase lighting, where twenty per cent shall be deemed active.

In Class C, which includes factories, hotels, clubs, churches, public buildings, etc., fifty-five per cent of the total connected load shall be deemed active

A minimum bill of $1 per month is a part of the schedule.

The commission states that the company shall not be required to install meters at its own expense for any consumer in Class A having an installation of less than five fifty-watt lamps or the equivalent thereof, nor for any consumer in Class B or C using less than three fifty-watt lamps or the equivalent thereof.

Westinghouse Buys Electric Line.

The Westinghouse Electric and Manufacturing Company has purchased a controlling interest in the Interworks Railroad which runs from East Pittsburg, through the boroughs of Turtle Creek, Wilmerding, Pitcairn, and Trafford City, a distance of about seven miles.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

JOINT MEETING WITH THE BRITISH INSTITUTION OF MECHANICAL ENGINEERS.

A joint meeting of the American Society of Mechanical Engineers and the Institution of Mechanical Engineers was held in England during the week of July 25. At the meeting on July 30 in London the subject for discussion was the electrification of railways. Three of the papers which were presented have been already abstracted in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for July 2. They are "Electrification of Railways," by George Westinghouse; "Economics of Electrification," by William B. Potter; and "Electrification of Trunk Lines," by L. R. Pomeroy.

Two other papers on the same general subject were presented at the meeting by members of the British Institution. These were "Electrification of Suburban Railways," by F. W. Carter, and "The Cost of Electrically-Propelled Suburban Trains," by H. M. Hobart. Abstracts of these are given below:

ELECTRIFICATION OF SUBURBAN RAILWAYS.

Many British railways have, so far as their suburban passenger traffic is concerned, been affected very adversely in recent years by the great and increasing competition of tramcars and motor-omnibuses. The companies concerned appear undecided at present between giving up a great portion of this traffic permanently and endeavoring to regain it by electrification of their suburban lines. The latter expedient, although an expensive one, has invariably been found successful in regaining much of the lost traffic, and the problem confronting a company in regard to any of its suburban lines is that of determining whether the expected gain from electrification will justify the expense to be incurred. Modern electric railway apparatus leaves little to be desired in the matter of freedom from breakdown, the delays from all causes, electrical and mechanical, during December, 1900, averaging about thirty-three seconds per day per train on the District Railway, and only two and one-half seconds per day on the Underground Electric Railways tubes. The total cost for maintenance and repairs of rolling stock on these lines does not exceed 1.2 cents per car-mile. There are eighteen suburban electric railways at present working in Great Britain, including seven tube lines. These comprise about 200 miles in all and are mostly operated on the multiple-unit system, employing motor coaches of the saloon type. In typical suburban service the greater part of the energy input is used in accelerating the train. The energy consumption per ton-mile depends principally on the nature of the schedule and is a good measure of the difficulty of a schedule. An even better measure of this is the uniform acceleration that could cause the train to reach the mean running speed in a distance equal to the average distance between stations. A high initial rate of acceleration involves great mechanical strains on the tracks, and should not be employed unless the schedule makes it imperative. The equipment losses during acceleration are of the same order of magnitude in the direct-current as in the single-phase system, in spite of the rheostat losses in the former. The performance of a given electric train under given conditions of suburban service can be very closely predetermined, for the factors liable to uncertainty have but small effect on the result. Schedule calculations, however, are inadequate by themselves to determine the question of suitability of an equipment, as the limiting features are usually connected with the heating of the motors, which depends on the losses in the motors. These losses are much greater in the single-phase than in the direct-current system. In the author's opinion, there appears little prospect of the general electrification of British railways, as there seems to be no advantage apparent which would justify the expense. In the case of heavy suburban service only is there prospect of commercial advantage accruing from electrification, and, while there may be other local opportunities for electrical operation, there is at present no indication that the steam locomotive can be superseded with advantage for ordinary main-line work.

COST OF ELECTRICALLY PROPELLED SUBURBAN TRAINS.

Electrical propulsion permits of increased speed and capacity, relieves congestion and increases revenue for suburban passenger traffic, while it permits the retention of steam-locomotive methods in long-distance traffic. Different systems of electrical propulsion of suburban trains vary greatly as regards the capital outlay per train and as regards the energy consumption per train-mile. In any electrification project it is therefore necessary not only to compare electrical with steam-locomotive methods, but also to compare various electrical methods. Preliminary cost estimates are facilitated by assuming that the railway will purchase its electricity from supply companies owning all works up to the distributing system and supplying the current in the form in which it is to be consumed by the train. The chief items of cost, which differ from those of steam-locomotive methods and which vary with different electrical systems, are: (1) Cost of the electricity; (2) annual charges for the rolling stock; (3) cost of the distributing system (overhead trolley or third rail and the necessary feeders) between the point where the supply company delivers the current and the trains. Mr. Hobart makes the assumption in his paper that the third item is independent of the particular electrical system employed and that the estimates are narrowed down to the first two items, which for suburban service take about thirty-five or forty per cent of the gross receipts. The direct-current system provides, per ton of equipment, eleven horsepower at the axles (averaged over the journey), as against six horsepower per ton in the single-phase system. In either system the cost is about $625 per ton of equipment. For a service where trains pass in each direction at intervals of twelve to fifteen minutes, representative figures for the cost of the electrical energy delivered to the railway company in the required form from the substations are 1.75 cents per kilowatt-hour for direct-current and 1.40 cents per kilowatt-hour for single-phase supply. Taking into account that the total consumption (after allowing for non-remunerative train movements and for unavoidable departures from the regular time-table) is about thirty per cent greater than the consumption per recorded train-mile, the cost of electricity per train-mile is computed by the author to be from twenty to thirty cents for 180-foot single-phase trains and from twenty to twenty-six cents for similar direct-current trains. The lower values are for a moderate service, such as twenty-two miles per hour with one stop each 0.88 mile, while the higher values are for a rather severe service, such as thirty miles per hour with one stop each 1.32 miles. The annual charges for the rolling stock are computed as 17.2 to 21.0 cents per train-mile for single-phase trains and about twelve cents per train-mile for direct-current trains. Thus the sum of the energy charge plus the annual fixed charges for single-phase trains is about six cents higher per train-mile in moderate service and twelve cents higher in severe service than it is for direct-current trains. The estimates, as worked out in Mr. Hobart's paper, show that for suburban passenger traffic the direct-current system has very decided advantages over the single-phase system, and these advantages are greater the more severe the service—that is, the greater the schedule speed and the shorter the distance between stops. This is the precise work where electrical methods afford to railways commercial advantages unattainable by the steam locomotive. The author concludes that for services where there are many miles between stops and where considerable time elapses between successive trains, the use of steam locomotives permits commercial advantages unattainable with any electrical systems comprising the feature of transmitting the energy to the train.

The discussion was opened by H. F. Parshall, of the Central London Railway. He pointed out that both the New York Central and New Haven Railroads were handling a class of traffic that could not be handled by steam; but he did not regard the New Haven Railroad as an electrical system since the usual safeguards as to reliable operation had been most studiously eliminated and the system as it stood would not be operative in Great Britain.

As regards Mr. Westinghouse's paper, he pointed out that it was erroneous to state that transmission was the principal element to be considered in respect to electric traction installations; that, owing to the regulations of the Board of Trade in this country, the transmission system as a whole was a great deal more expensive than in the United States, and that the cost of the transmission system, including energy losses, and capital charges, was about fifteen per cent of the total as against forty-five per cent chargeable to the electromotive outfit, and thirty-five per cent of the power-station charge. He pointed out that the cost of the transmission system, even under the extravagant conditions obtaining in Great Britain (which did not obtain in America) was but one-third of the cost of the electromotive installation and that in applying the differences commonly recognized and proved, the difference between single-phase and

continuous-current motors would more than wipe out the whole fifteen per cent in the transmission system. He further pointed out that if the energy were transmitted single-phase, the cost of copper in the single-phase, with the same power-factor, would be one-third more for the alternating-current system than for the direct-current system; also that allowing for ten per cent additional loss for the rotary converter of the direct-current system, for equal current density, the cost of copper with power factor 0.75 would exceed by sixty per cent that of the direct-current system and for equal energy loss would be double that of the direct-current system, always on a basis that the alternating-current train outfit was as efficient as the direct-current outfit.

In conclusion, he stated that the direct-current system was the only one known in the present state of the art that could compete with steam in the classes of installation to which electricity is generally applicable; that is, to urban, suburban and dense interborough traffic.

J. Dalziel, of the Midland Railway Company, who has been jointly responsible for the design and equipment of the single-phase line between Heysham and Morecambe, did not agree with the view that the electrification of main-line railways was out of the question. In fact, he believed it was comparatively imminent. It was certainly commercial and the most important problem was to find a general system to be adopted universally. He disagreed entirely with the remarks of Mr. Hobart, for the single-phase system certainly did not possess all the disadvantages attributed to it. It was also important to remember that the general conclusion arrived at, at the recent International Railway Conference at Berne, was in favor of the single-phase system. It was his opinion that much expense could be saved in avoiding the doubling of main-line tracks by the adoption of electricity. Another factor which was overlooked from the point of view of expense to the railway companies was that it would be possible to burn a much cheaper quality of coal in a central power station than is now possible in locomotives. Another factor in favor of electrification in this country was the large amount of terminal and shunting work which was done. The Midland Company's single-phase line had only had four breakdowns in two and a half years and none of these were due to the use of the single-phase system. Dealing with Mr. Hobart's figures of comparison between the continuous current and single-phase systems, Mr. Dalziel contended that these were all based upon the Siemens equipment and not the Westinghouse equipment, and further, that the general conditions assumed, in order to get the comparison, were not those under which the Morecambe-Heysham line was working.

Mr. Stone referred to the excessive rail wear on lines using the multiple-unit system and remarked upon the fact that on the City & South London Railway, where electric locomotives are used, the wear was not so marked. He thought this pointed to the necessity of having a greater proportion of the driving power on the front motors and so keep all the drawbars tight instead of as at present, with the multiple-unit system, having them slack, which resulted in a crushing up of the carriages at the moment of starting.

C. F. Scott, of the Westinghouse Electric & Manufacturing Company, thought that Americans had devoted most attention to systems rather than the general features of the application of electricity to railway working. The reason for using electric motors was not to save power, but in order to efficiently use more power. He looked to the electrification of railways as a means of saving much expensive widening of tracks. He rather deprecated such comparisons as Mr. Hobart had made because the slightest error in the assumptions lead to very erroneous results and it rather looked as if there were some errors of this sort in Mr. Hobart's case. A matter which needed some consideration was the cost of power which, in Mr. Pomeroy's paper, was given as sixty per cent of the total cost of working. He disagreed with Mr. Potter's suggestion as to the number of cars necessary for running a service—namely, two in the sheds for every one running. In his opinion, for pure trunk-line working, the single-phase system was the only one, and it was interesting to note that the only real trunk line being operated in America by electric traction—namely, the New York-New Haven line—was now purchasing new locomotives and going in for extensions generally upon the single-phase system.

Philip Dawson sent a telegram regretting his inability to be present, and pointing out that all Mr. Hobart's comparisons had been founded on erroneous data which vitiated all his conclusions.

H. M. Hobart, referring to Mr. Potter's paper, agreed that perhaps for the 100-mile line mentioned, single-phase might beat continuous current, but in those cases, where single-phase was cheaper than continuous current, steam would beat them both.

Angus Sinclair did not think that there was much possibility of electricity beating steam for freight traffic in the United States for a long time to come.

J. G. Wilson, of the Great Eastern Railway, did not think it would be wise at present to standardize a system of electric railway working. It seemed to him that on railways having a heavy suburban traffic, such as the Great Eastern, the direct-current system would be cheapest whilst on a line such as the Great Northern, with a heavy mineral traffic, the single-phase system would be the best. In view of the immediate advantages of the electrification to individual lines he did not think it wise to postpone general electrification for the sake of the problematical advantages of a standard system in the future which would enable interchange of traffic to take place.

Professor Hutton thought the conditions of railway working in cities needed consideration before the long lines running into the country. He thought it would be a long time before the latter would need to be converted to electric traction.

J. A. F. Aspinall, of the Lancashire & Yorkshire Railways, said that his experience was that heavy electric locomotives with large bearing surfaces and large journals based upon steam locomotive practice were becoming necessary. At present the center of gravity was very low and the weight was not spring-borne; hence the wear and tear on the rails was excessive. No general manager could afford to close his eyes to the possibilities of any system of electric traction in order to utilize the rolling stock to the greatest extent. The feature of railway working at present was the extraordinarily small amount of time that the locomotives were doing useful work. Figures had been collected which showed that for only twenty-eight per cent of their time were locomotives in use.

CENTRAL-STATION PRACTICE

Transmission—Interior Wiring.

A UNIQUE PLANT AT QUINCY, ILL.

BY C. L. VESTAL.

Within the past year the Soldiers' and Sailors' Home, at Quincy, Ill., has put into operation a neat little power station for its own exclusive use. Heretofore whatever power has been necessary has been furnished by the Quincy Gas and Electric Company. For a number of years past, however, there has been each year an effort made to induce the state to authorize the construction of an independent plant, and this effort has finally been successful.

The boiler installation for this plant consists at present of four 225-horsepower water-tube boilers and two fire-tube boilers of 125 horsepower each. The total boiler-horsepower is thus 1,150, which is more than twice as much as is ever needed for power alone, but all of the buildings comprising the Home are heated with steam direct from these central boilers. The latter are equipped with mechanical stokers.

In the power room there are two engine-type sixty-cycle three-phase alternators. Both engines, the larger of 225 horsepower and the smaller of 125, are of the Ball make, simple and non-condensing. The generators are of the revolving-field type, the larger of 150 kilowatts rated capacity, and the smaller of seventy-two kilowatts. The larger is designed for 150 revolutions per minute, and the smaller for 300. The primary pressure is 230 volts.

There is one belted exciter of the usual pressure—125 volts—and one motor-generator exciting set. The motor for this is of the induction type, with squirrel-cage rotor, and is rated at fifteen horsepower at 1,150 revolutions per minute. The generator has a rated load of ninety-six amperes.

From the six-panel switchboard this little plant supplies all the power necessary about the Home. There are now connected about fifteen motors, mostly induction, ranging from one-half horsepower up to twenty. These are used in the kitchen, machine shop, laundry, and for pumping purposes. In addition there are several hundred incandescent lamps, and a number of the usual 7.5-ampere alternating-current arcs.

Transformers have been used very liberally. In fact, to transmit the energy only a few blocks it is stepped up to 2,200 volts secondary, and then down again to whatever working pressure is necessary for the motors or lights.

The casual visitor who knows anything of the electric generation and distribution of power is not impressed with the economy or efficiency of this little plant. In the first place one would have thought that since simple non-condensing engines were to be used the exhaust steam might easily have been utilized to supply much of the heat, and thus have caused the necessary boiler capacity to be reduced. But even if this, because of its small ratio to the total amount of steam heat necessary, were not considered worth while, it looks as if there were a great waste of money in transformers. The primary pressure of 230 volts, which could just as well be 220, is ample for transmission over any distance from the plant within the Home grounds, as this is probably in no case more than one-half or three-quarters of a mile, and is commonly much shorter. It would seem probable that the actual loss of energy in the transformers is now as great as such loss would have been in using the direct primary voltage for the incandescents and motors. This means that the cost and upkeep of most of the transformers is just that much money thrown away.

There is also in the power room a steam-operated York refrigerating machine, which supplies refrigeration for the Home kitchen a short distance away.

The new power building which is to be erected at St. Paul, Minn., will be seven stories in height and 86 by 300 feet in size.

HIGH TENSIONS AND LINE CALCULATIONS.[1]

BY A. R. GARNIER.

The calculations and conclusions here following are the result of study and observation of the practical working of the high-tension transmission lines lately put in operation:

Choice of the Transmission Voltage.—Economy is paramount in this, but the algebraic expression of this evident truth is very difficult on account of the varying factors entering in the calculations. In fact, while the cost of conductors decreases with the increase in voltage, the cost of machinery, auxiliary apparatus and protection increases. It is due to this that while an economic law can be established easily for lines of average length, it is more difficult to define mathematically for long-distance lines in which copper economy increases more rapidly with the tension than the concomitant auxiliary expenses. Table I may be useful in regard to this.

TABLE I.

Length of the line in miles.	Approximate economical voltage.
Less than 1.0	500 to 1,000
1.0 to 1.5	1,000 " 2,200
1.5 " 3	2,200 " 6,600
3 " 10	6,000 " 13,200
10 " 15	13,200 " 22,000
15 " 20	22,000 " 44,000
20 " 40	44,000 " 66,000
40 " 60	66,000 " 88,000
60 " 90	88,000 " 110,000

Frequency.—If we consider only the transmisson line, low frequencies are to be preferred, as the inductions and the proportional charging current decrease. Inductance $= 2 \pi f L$, where f = frequency; L = self-induction. Charging current $= 2 \pi f C E$, where C = capacity, E = voltage. But the natural frequency of the line is $f = 5035/\sqrt{L C}$, and by calculation it can be shown that danger from harmonics is less in low-frequency lines.

Corona Effect.—Observations show that: (1) Under given atmospheric conditions the corona effect only starts when a critical value of the voltage is

1 Translated and abstracted from *L'Electricien* for January 15, April 23 and 30, and June 4, 1910.

reached, this value increasing with the diameter and distance apart of conductors. (2) The above observation is valid either with solid or stranded conductors. (3) Above the critical voltage, losses increase rapidly with the voltage. They are a function of the atmospheric conditions and consequently vary from one locality to another. The presence of solid or liquid particles (smoke, dust, snow, humidity) increases the losses. Rain does not seem to have any appreciable influence. (4) The conductor material has no influence on the corona effect, whose magnitude depends upon the maximum value of the voltage wave.

Table II, calculated from a large number of observations, gives the value in kilovolts of the approximate critical voltage for usual interaxial distances.

Distance Between Conductors.—Table III is in accord with actual practice for normal wind velocities.

Kelvin Effect.—For the usual conductors and frequencies the increase in resistance due to skin effect is a negligible quantity; in a solid conductor twenty millimeters in diameter it is (at sixty cycles) only 2.5 per cent, and smaller than that for a stranded cable. When armored cables are used it must be taken in consideration as the presence of magnetic material increases considerably the Kelvin effect.

Aluminum as Line Material.—It gives (1) Economy in labor cost and weight of support on account of its lower weight. (2) The system inductance is increased. This is due to its higher elongation and tension coefficient. The sag being greater for the same span length, longer poles and a greater distance between conductors are required. (3) The relatively low fusion point increases arcing dangers, and the larger diameter of the conductors increases the wind action.

Self-induction.—Three conductors arranged in an equilateral triangle will have less inductance than when in one plane, the distance between conductors being the same.

Mutual Inductance of Two Lines.—The inductive effect of one line on any other is related to the algebraic sum of the fluxes in the conductors of the inducing lines, and it can be eliminated by an even number of transpositions of the two lines.

Capacity.—Capacity in electrostatic units for centimeter length of line of two conductors is given by

$$1/C = 4L(D-r)/r$$

where D = the interaxial distance of the two conductors, r = radius of conductors.

The author then proceeds to establish some formulas for economical line construction. For a given difference of potential at the distributing end and a fixed output at the generating end, a mathematical expression of the most economical line loss in ratio to the generation and installation cost can be derived.

The line losses are due to the resistance only while the voltage drop is a function of this resistance and the reactance; and the annual cost of the line is made up of two factors, namely; the one resulting from the Joule effect, the other from the rate of interest and depreciation on the capitalized installation cost.

If we let

U =potential difference at the distributing end,

P, P^1=the kilowatt output at the generating, distributing end,

L=the length of the line (single conductor),

F=the cost per kilowatt-year at the generating end,

a=the cost per unit length of the conductor,

f=the rate of interest and depreciation on the conductors,

r=the resistance in ohms per kilometer,

p=the weight per kilometer, per square centimeter,

R=the total resistance of the line,

S=the cross-section in square centimeters.

x, x^1=the loss in percentage of P, P^1,

The formulas to be used for economical loss and cross-section are as follows:

For a monophase line,

$$x = \sqrt{\frac{A}{FU^2 + A}}$$

$$S = \frac{2000\,(1-x)^2\,PrL}{xU^2\cos^2\phi}$$

where A has the value

$$\frac{4000\,P\,a\,f\,L^2\,r}{\cos^2\phi}$$

For a three-phase line we may substitute ¾A for A, and taking into consideration that the cross-section of each conductor is just half of the one that would be used for an equivalent single-phase system, that is, for equal drops and losses, there is a 25 per cent gain in the weight of the conducting metal, we have

$$x = \sqrt{\frac{3A}{4FU^2 + 3A}}$$

$$S = \frac{1000\,P\,(1-x)^2\,rL}{x\,U^2\cos^2\phi}$$

As generally the calculated value of S does not correspond to a standard cable section, it is necessary to adopt the nearest value of cross-section and calculate the value of x^1, the corresponding loss.

If we let

S^1=the standard cross-section to be used,

R^1=the corresponding total resistance,

we have $\dfrac{R^1 P}{U^2\cos^2\phi} = \dfrac{x^1}{(1-x^1)^2} = K$

from which $x^1 = \dfrac{(2K+1) \pm \sqrt{5K+1}}{2K}$

which can be used either in single or three-phase work.

Calculation for a High-Tension Transmission Line.—As an example, consider a three-phase line for 20,000 kilowatts and fifty cycles, current to be transmitted a distance of 150 kilometers with $\cos\phi = 0.85$.

If the cost per kilowatt-year is estimated to be 400 francs, the rates of interest and depreciation are taken as ten per cent, and copper is chosen for the conductor, then the known quantities are

L=150, F=400, f=0.10, p=890 kilograms, a=2 francs.

If the average temperature is taken as 15° Centigrade, then we have r=0.17. The quantities to be determined will then be (1) the potential difference at the receiving end, and from Table I we will take it as 100,000 volts. (2) The most economical loss. Substituting in the formula for A, we have

$$A = \frac{4000 \times 890 \times 2 \times 0.1 \times 150^2 \times 0.17}{0.722} = 382 \times 10^7$$

and then

$$x = \sqrt{\frac{3 \times 382 \times 10^7}{4 \times 400 \times 10^{10} + 3 \times 382 \times 10^7}} = 0.0266$$

then the most economical line loss is

2.66 per cent. (3) Conductor cross-section. Substituting in the equation

$$S=\frac{1000(1-.0266)^2\times 20000\times .17\times 150}{10^{10}\times 0.722\times 0.0266}=2.5 \text{ square centimeters}$$

As the standard commercial cross-section nearest to this is 2.44, this will be used and x^1 (corresponding line loss) can be calculated. (4) Conductor weight is given by $3LS^1p$ and equals $3\times 150\times 2.44\times 890 = 977{,}220$ kilograms. (5) Conductor cost is $977{,}220\times 2=1{,}954{,}440$ francs. (6) Annual interest and depreciation is ten per cent of this or 195,444 francs. (7) Resistance per single conductor is given by

$$R^1=r\frac{L}{S^1}=0.17\frac{150}{2.5}=10.2 \text{ ohms.}$$

With the increase due to the Kelvin effect taken for the conductor and frequency used as 1.65 per cent, we have

$R=10.2\ (1+0.0165)=10.37$ ohms.

(8) Real line loss.—It is now possible to calculate the real line loss with the standard cross-section (2.44) used.

TABLE II.

Interaxial distances.	Diameter of the wires in millimeters. 3	5	12	25
250	23.0	39.0	64.0	161.0
500	26.5	46.0	78.0	230.0
1,000	30.0	53.0	92.0	300.0
2,500	34.5	62.0	110.0	390.0
5,000	39.0	69.0	124.0	460.0

In fact, if we put $K=\dfrac{1000\,RP}{U^2\cos^2\phi}$

we have

$$K=\frac{1000\times 10.368\times 20000}{10^{10}\times 0.722}=.0287$$

and substituting this value in the formula for x^1 we get

$$x^1=\frac{1.0574\pm\sqrt{1.1148}}{.0574}=.0278$$

(9) Power loss on the line.—This loss is $RI^2=Px^1$ or, in our case, $20{,}000\times .0278 = 556$ kilowatts.

(10) Power delivered at 100,000 volts with a power-factor 0.85, we have 20,000—556=19,444 kilowatts.

(11) Kilovolt-amperes delivered at the receiving end.—This is given by the ratio

$$\frac{19{,}444}{0.85}=22{,}875$$

(12) Current.

$$I=\frac{22{,}875}{100{,}000\sqrt{3}}=134$$

TABLE III.

Voltages.	Distance in meters.
5,000	0.70
15,000	1.00
30,000	1.25
45,000	1.60
60,000	1.90
75,000	2.25
90,000	2.50
100,000	2.80
120,000	3.00

(13) Space between conductors.—It will be taken from Table III as 2.5 meters.

(14) Line capacity. The capacity between two conductors can be computed from the formula

$$C=\frac{.012}{\log\frac{D}{r}}$$

microfarads per kilometer, or

$$C=\frac{.012}{\log\frac{250}{.9}}=0.0049$$

Total capacity of the line $=0.005\times 150 = 0.750$ microfarads.

(15) Charging current per single conductor is

$$6.28\times 50\times 0.75\times 100{,}000\times 10^{-6}=23.55$$

(16) Self-induction. The conductor being braided, of a diameter of twenty-millimeters, we will apply the formula $L=.46\log D/r+0.05$ and taking $D=2.5$ meters we have $L=1.153$ millihenries, from which the self-induction of the line (single conductor) is

$1.153\times 150=173.$ millihenries.

(17) Inductive reactance. For a single conductor and per kilometer it is equal to $2\pi fL$, and in our case

$2\times 3.14\times 50\times 0.00115=0.362.$

The three-phase reactance will be

$1.732\times 0.362=0.627$ per kilometer.

The total line reactance will be

$0.627\times 150=94$ ohms.

(18) Natural frequency of the line. This periodicity F is

$$F=\frac{1}{6.28\sqrt{LC}}=\frac{1000}{6.28\sqrt{0.173\times 0.75}}=442$$

Electric Light System at Gary, Ind.

The Gary Heat, Light and Water Company, which supplies electricity for commercial and domestic purposes in Gary, Ind., is a subsidiary of the Indiana Steel Company, which operates the steel plant. The electric company has a modern and very ornamental substation, in connection with its motor-driven water-pumping plant. This station receives 6,600-volt, twenty-five-cycle, three-phase energy from the blast-furnace gas-engine-driven generating station of the steel company, transforming it to 2,200 volts for local distribution, and also supplies 150 street-lighting series arcs with sixty-cycle energy through motor-generator frequency changing sets and constant-current transformers.

The Gary substation represented the most modern and approved practice at the time of its construction two years ago. It was laid out to serve the future city of 200,000, which the steel company's actuaries predict must eventually be located at this point. As the result of the ample transforming equipment installed, the Gary substation at present has the distinction of supplying more energy for its own transformer losses than is purchased by all its consumers. According to the station instruments, of about 110,000 kilowatt-hours supplied monthly to the substation, only 30,000 are charged for on customers' meters. The present population of the city is 22,000, although this figure is growing rapidly. The company now has 1,200 electric customers, each using an average of thirty-five kilowatt-hours per month. The lighting rates are eleven cents per kilowatt-hour for the first fifty kilowatt-hours, ten cents for the next twenty-five, nine cents for the next twenty-five, eight cents for the next 200, and seven cents for all over 300 kilowatt-hours' monthly consumption—all subject to a ten per cent discount. The power rate is seven and one-half cents per kilowatt-hour, for one hour's use per day of the rated horsepower of motor, after which the charge drops to three and one-half cents per kilowatt-hour. Lower rates are available for power customers whose monthly bills are over $50.

Broadway, the principal thoroughfare of Gary, has special street illumination employing series tungsten lamps on ornamental posts. Each regular post carries two sixty-watt and one 100-watt series tungsten lamps, while the special standards marking the street intersections are fitted with an extra pair of arms carrying two sixty-watt tungstens at right angles to the regular arms. This lighting is in addition to the regular city arc lamps mounted on the center trolley poles at 300-foot intervals.

The series circuits are supplied with a constant current by tube-type regulating transformers, from the 2,200-volt, twenty-five-cycle secondaries of the substation transformers, which reduce the 6,600-volt transmission potential from the steel-plant power-house.

Leonard Fitzgerald is superintendent of the Gary Heat, Light and Water Company.—From *The Iron Trade Review.*

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

CONCLAVE OF KNIGHTS TEMPLAR IN CHICAGO.

DECORATIVE AND SPECTACULAR ELECTRIC DISPLAY.

The present week, from August 8 to 13, was marked in Chicago by the peaceful invasion of the great hosts of Knights Templar who took practical possession of the city on the occasion of the thirty-first triennial conclave of the grand encampment of the United States. These conclaves being gatherings of men of affairs are always marked by great splendor and pageantry. The present occasion was exceptionally so because the arrangements were planned with the greatest care, the weather was fine and the mass of visitors was variously estimated at between 250,000 and 300,000. On the whole this conclave was voted as the greatest and most successful Masonic gathering ever held in this country.

The decorations throughout the downtown district were unusually attractive and in making them so electricity played a leading part. Combined with the national colors were the black and white of the Templar order and interspersed among the flags, banners and bunting were shields, emblems, armorial arms and other insignia suggestive of the days of medieval knighthood and chivalry. Although every business street was gayly decorated, State Street, the city's leading retail street, was a blaze of color by both day and night, and it seemed as if each merchant was trying to outdo his neighbor by the brilliancy and novelty of his display. Aside from the private decorations and lighting there were provided by the committee on decorations and electrical display four more formal decorative and spectacular features that attracted the greatest attention.

Spanning Michigan Boulevard at Park Row close to the depot of the Illinois Central and Michigan Central railroads there was erected an "entrance" arch. It marked the entrance to the city for the visiting Knights and also the entrance to the more important part of the line of march of the grand parade on Tuesday. This arch was of castellated construction suggesting an ancient battlement at a

DAY VIEW OF THE ELECTRIC FAC SIMILE OF THE OFFICIAL EMBLEM.

city's gate. It was cunningly made to resemble massive masonry and was covered by an English ivy that looked as if it had been growing there for centuries. During the parade buglers stationed on the battlements heralded the approach of each grand division. At night this arch and its turrets were brightly outlined with incandescent lamps. The windows in the structure were beautifully illuminated by colored lamps to give the effect of rich stained glass. About 800 electric lamps were used in this arch.

Another arch which attracted much attention, and which added greatly to the effectiveness of the entire display was the "grand commandery" arch erected near the corner of La Salle and Madison streets, at a point just before the place of disbanding of the grand parade. Although of simpler design than the "entrance" arch, it was striking on account of its whiteness and the mass of Knight Templar emblems and banners which it bore. Surmounting the columns at each end of the arch was a knight in full armor on horseback. This arch was studded with over 1,000 incandescent lamps, which brought out all its details in brilliant white.

The most spectacular feature of the entire decorative scheme was the mammoth electric sign, erected in Grant Park, at the foot of Jackson Boulevard, reproducing the official emblem of the conclave. This badge, which was said to be the largest spectacular sign ever built, was 135 feet in height above grade and sixty-four feet across the word "Welcome" at the base. The 4,400 four-candlepower tungsten lamps of red, white, blue, yellow and purple color used in illuminating this sign brought out the various features of its design in a striking manner.

The framework for the sign was of steel construction set on concrete foundations. About eleven tons of steel were used in the framework and the concrete piers upon which this rested were six feet square and eighteen feet deep. For wiring the sign approximately 18,000 feet of double-braid, rubber-covered wire were used.

A view of this sign is shown in an accompanying illustration. The helmet at the top was seven and a half feet high and six feet wide. That part of the emblem containing the crossed swords was forty feet wide and twenty-eight feet high. The letters in the words "31st Triennial Conclave" were two feet high. The sword hilts were eight feet in length by two feet in width and the sword points were five feet in length by two feet in

width. The eagle in the center of this upper design was twelve feet from tip of bill to end of wing.

The middle portion of the emblem representing the mounted knights and with the words "Grand Encampment of the U. S." was thirty-two feet wide and twenty-two feet high and from the top of each knight's head to the horses' hoofs measured sixteen feet.

At the bottom of the badge was the Knights Templar emblem. This portion of the sign was thirty-eight feet high and thirty-five feet wide. The cross in the center was ten feet high and six and a half feet wide. The

A DECORATED HOTEL.

letters in the word "Welcome," at the bottom of the sign, were ten feet high.

To operate the sign three separate flashers were used, one for each section of the emblem. These flashers were controlled by a master flasher set at the bottom of the sign. The operation of the sign was as follows:

The upper part of the emblem flashed on first. Instantly thereafter the circle of lamps around the eagle and shield and the circle of lamps around the letters "K" and "T" revolved. The lamps in the ribbon in the mouth of the eagle produced a waving effect.

The middle section of the emblem flashed on soon after the first section, and simultaneously the horses' feet of the mounted knights were in motion.

GRAND COMMANDERY ARCH.

Quickly following this the lower section flashed on, the lamps studding the crown fluctuating so as to represent the sparkling of jewels. The word "Welcome" at the bottom of the sign was steady-burning.

After the operations described above, all of the lights were flashed off, then flashed on together and remained burning for a short time. They were then flashed off together and the cycle of operation repeated.

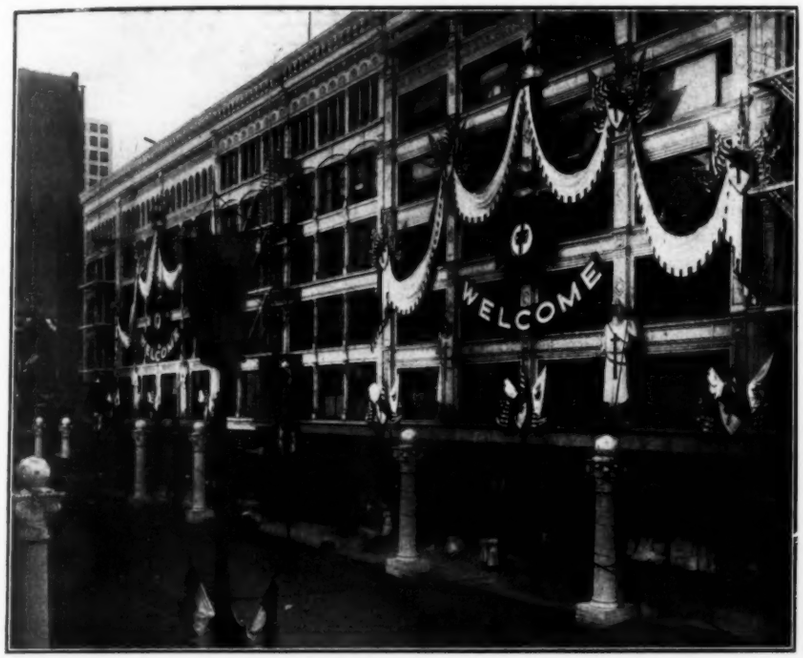
This great electric spectacle was planned by G. B. Coffin, chairman of the committee on decorations and electric displays. The Thomas Cusack

DECORATIONS OF BUILDINGS ALONG "TEMPLAR WAY."

Company, Chicago, was the builder and S. W. Van Nostrand, of this company, was in charge of construction.

Brief mention has already been

made of the decoration of State Street. This street for the six blocks between Randolph and Van Buren streets was transformed into the "Templar Way." forty-eight lamps, the total number on the columns being 6,280. In the 120 double spans of streamers between the columns there were over 8,000 green



DEPARTMENT STORE DECORATED ALONG "TEMPLAR WAY."

On each side of the street was erected a row of white columns between which were streamers of laurel. The total number of columns erected were ninety-one. Each was surmounted by a lamps almost hid among the laurel. At the middle points of the longer spans were mounted Templar shields and emblems, many of which were electrically illuminated.

NIGHT VIEW OF "TEMPLAR WAY."

beautiful capital and on this was placed a globe studded with twenty-one stars. In each star was an incandescent lamp socket. About the capital there were

Supplementing the attractions of this white colonnade was a most general decorative display by the individual merchants along the "Templar Way." Naturally the larger department stores led in the gorgeousness and novelty in which their buildings and stores were decked. Many of the large designs were electrically lighted. There was never such a brilliant display of window lighting in Chicago as was seen this week. There were even erected a number of new large electric signs on the building tops.

The verdict of many competent to judge was that Chicago's electrical display in the past week was the most splendid festival lighting ever seen outside the Hudson-Fulton celebration in and near New York City last fall.

COMMONWEALTH EDISON BUILDING.

All the current for the four special lighting features and for mostly all the private displays was furnished by the Commonwealth Edison Company of Chicago.

Special Illumination in Syracuse.

A special system of illumination in South Warren Street, between East Fayette and East Jefferson streets, in Syracuse, N. Y., has been started, and it is stated that efforts will be made to complete the installation by August 15. Opposite posts on both sides of the street will be erected at equal distances along the curb. They are about nine feet high, and are surmounted by five large incandescent lamps. A number of large electric signs in the street will also add to the general effect.

ELECTRICAL Advertising *and* Selling

THE ETHICS OF CENTRAL-STATION ADVERTISING.

BY CHARLES A. PARKER.

Not so very many years ago, the idea of associating "ethics" with "advertising" would have been deemed a matter for the consideration of the comic weekly satirist rather than as an appropriate subject for a serious article. Fortunately, however, what held true a few years ago does so no longer and a study of the ethical side of advertising in general, with particular reference to central-station advertising, comes quite logically within the scope of our present series of articles.

Within the last few decades, the business world has experienced a remarkable change of heart. The old time-honored doctrine of "Caveat Emptor" has been gradually relegated to the dusty and cob-webby shelves of antiquity. Industry and commerce, at least in their higher and better phases, recognize the fact that the real interests of both parties to a transaction are mutual and that he who takes advantage of an opportunity to "put one over" on the other fellow is in effect killing the goose that may lay golden eggs for him in the future.

Quite aside from this intelligently selfish standpoint, however is the really ethical standpoint to which the world of business has been gradually swinging—the standpoint that business cannot ignore the question of right or wrong, but must take it into consideration regardless of purely individual interests. This is but one manifestation of the movement for social betterment that is sweeping over the country. Employers show a greater disposition to watch out for the welfare of their employees and the rights of those with whom they have dealings than they were to do in days gone by. There is a realization of duty to others that is responsible for a code of business ethics gradually assuming definite shape and coming to be thoroughly recognized throughout the land. Having developed along with this new spirit in business, modern advertising must necessarily keep in harmony with it. It must have for its basis a broad code of ethics of general proportions. Its power and potentialities are too great to take a narrow view of the matter. The advertiser who winks at little dishonesties, connives at things in his advertising that would not be tolerated in a salesman, is building his houses on the sands, to be destroyed by the first storm that happens to come along.

All this is especially true of central-station advertising, for the very simple reason that the central-station advertiser occupies a different position with respect to his prospects than does the ordinary advertising man. When the central-station advertiser wins his point, he does not sell some article and then count the deal as closed. He is endeavoring to induce people to enter into a contract of more or less permanent relationship with his company. If he makes false pretenses in order to accomplish his purpose, he is but sowing the wind, leaving the whirlwind to be reaped by the central station. Central-station advertising should be designed in harmony with a broad-gage set of rules respecting the rights of all, not because such a course is the only one calculated to promote the interests of everybody concerned, but also because, abstractly considered, it is the only right course to adopt.

"Abstractly speaking" is generally considered as a poor way to speak when any phase of business is under consideration. Nevertheless, and at the risk of being disputed, the writer ventures the assertion that the abstract question of what is right and what is wrong deserve as serious consideration from the advertiser as from the scholar, or doctor, or lawyer. In other words, the first-named gentleman feels as strictly bound by the ethics of his profession as should any of the gentlemen mentioned. Only when advertising men in general take this attitude will advertising come into the fullest realization of its own as a "Scientific System of Selling by Printed Words."

Turning from the "why" to the "what," the first question that confronts us is one of definition. What do we mean by "The Ethics of Central-Station Advertising"? For our purpose here the matter might be stated somewhat as follows: The ethics of central-station advertising consists of these basic principles that the central-station advertiser should adopt as the standards of right and wrong and in accordance with which he should do his work.

A consideration of the ethics of central-station advertising naturally involves a consideration of three points—(1) the question of originality; (2) the question of truth; (3) the question of duty to the advertisee.

Of the matters that we have to discuss in this article, probably no one point has received quite so much attention as this matter of originality, although, perforce, most of the talk has consisted of vehement denunciations of the man who borrows, appropriates or annexes ideas from the other fellow instead of digging them up out of his own little brain. All such discussion, however, really leads us nowhere. To really get the proper attitude and latitude, it is necessary to review the matter in a calm, dispassionate manner not usual with the virtuous denunciators of piratical advertisers.

The question of originality involves the relationship of the central-station advertiser to his brothers in the craft, rather than to the public he is addressing, the point at issue being to what extent he is bound to respect and keep away from the products of some other man's brain.

To set ourselves right at the very start, let us revert, as we have often done before, to the real purpose of advertising. Even the most casual student of the subject will be ready to admit that it does not exist to give the

1 The tenth of the present series of articles on "Central-Station Advertising" appearing in the second issue of each month.

advertising man an opportunity to display his intellect, his originality, or his cleverness. The purpose of advertising is to sell goods. This being the case, it is only natural to ask ourselves why such emphasis should be placed upon the virtue and absolute necessity for originality in advertising. If one salesman is not bound to stick to his own methods of selling, but many feel at liberty to borrow or adapt successful methods of other salesmen, why shouldn't the advertising man, who is really working toward the same end as the salesman, be permitted to do the same thing?

By way of answer we may cite three very good reasons why deliberate "borrowing" is bad—very bad—and should be placed at the head of a list of things to be considered unethical by the advertising man.

First of all, the analogy between the salesman and the advertising man is not a good one. No salesman can borrow the greatest assets of another salesman. Personality cannot be copied. And personality is probably the one greatest factor in separating salesmen into various grades of excellency. An indifferent advertising man, on the other hand, can appear quite brilliant if he have a sharp pair of shears and be a judicious clipper. Even this, however, would not be particularly objectionable were it not for the following two reasons.

Probably the worst feature of "swiping" is the fact that, as in all other cases of the illegitimate appropriation of property, considerable harm is done to the person from whom the idea or copy has a value to be measured in dollars and cents, and frequently in thousands of dollars and cents. For one person to use this idea when it originally belongs to another is to weaken its value to the latter. As far as actual facts are concerned, the swiper might just as well "break and enter in the night-time" and do all the other unlawful things necessary to the consummation of a life-sized burglary.

The most satisfactory feature about "swiping" is the fact that it is its own worst punishment. The habitual "swiper" is in the long run "hoisted" with his own petard. Sooner or later—and generally sooner—his borrowings are recognized for what they are, and then it's a long farewell to the effectiveness of his advertising.

With our attitude toward simon-pure "swiping" made clear, let us make bold to advance a step or two ahead of the ordinary writer on advertising by doing more than give voice to a warning against advertising piracy. Let us suggest that he who makes a fetish of originality is also in grave error.

There are some advertising men to whom originality is the greatest of all advertising gods. Not only must everything they produce be "children of their own brain," but their productions must be unlike anything that anybody else has produced. And right here is where they fall down. They forget the old adage that has something to say about "great minds" and "channels." They avoid ideas which are as much their own as anybody else's simply because somebody else has happened to think of the same ideas and "veins of ideas" from which they might otherwise derive great benefit.

This also should be remembered by the advertiser of the type we are describing here. One man's line of thought is limited. With nothing or but little to feed upon, he can scarcely hope to avoid far-fetched ideas and dullness—qualities which are, of course, fatal to good advertising.

But even yet we have not touched upon the greatest danger that threatens the advertiser who is blind to everything except his desire to be original in his advertising. He forgets that the mass of people is not original in its thinking. Their minds work along conventional lines. Anything entirely new and entirely outside of their previous experience, if it doesn't puzzle them, will excite their suspicion. Things they really take to as "new" or as "entirely different" are really nothing more than old friends in new dress. If an advertiser starts his work along lines absolutely unlike any that have been followed before, he will find that, at best, success will have to be preceded by a long campaign of education.

So much for originality. The really sensible and "ethical" view to take is that few ideas are absolutely original with any one. They are largely the result of impressions received at one time or another and stored in the subconscious mind until occasion demands their use. This being the fact, common sense would seem to advise that one study the work of others, learn all one can from it, and make use of the valuable hints that may be gathered. But with this proviso: Nothing shall be deliberately taken from another and no suggestion shall be worked out in such a way as to injure another advertiser who, by reason of priority, has first claim upon an idea.

There is, however, good reason for allowing the central-station advertiser greater liberty in using suggestions he can gather from other advertisers than most advertising can claim. The majority of central stations have no competitors; the scope of their effort is distinctly local; and they can often use the ideas of them with great benefit to themselves and with the least harm to the parties from whom the idea was taken. The same isolation which makes it possible and profitable for them to use syndicated advertising also makes it "ethical" and profitable for them to study the advertising of other central stations and concerns in other lines of business and make the most of it, always remembering, however, the limitations we have mentioned before—namely, a very scrupulous regard for intervals from any person from whom an idea is gained.

TRUTHFULNESS IN CENTRAL-STATION ADVERTISING.

Fortunately for the advertiser who loves truth for its own sake, even the man who is disposed to depend more upon his imagination than upon fact is coming to realize that falsehood is not only "unethical," but unprofitable as well.

No piece of advertising can be false and produce results of any lasting value. Whatever returns do come in before its untruthful character is discovered will be more than offset by the trouble and dissatisfaction that is certain to follow in its train. Nor is this the only result. Just as one bad apple will in time taint the barrel, so will untruthful advertising tend to spoil the value of all advertising produced by the central station, even though but a few examples be at fault. It should be the constant aim of every person who has anything whatever to do with advertising to foster and develop the confidence of the buying public. Because only when the public has full confidence in advertising will advertising realize its greatest possibilities. To this end the "ethics" of the profession should

not only demand that the advertiser himself insist first, last and all the time on truthfulness in his own advertising, but that he do everything in his power to squelch and drive out of business the man who thinks of nothing but getting what he can by saying whatever he thinks his public would like to hear.

To say that one should tell the truth and avoid falsehood is comparatively easy. There are finer distinctions, however, to be made than this. For instance, a very exact line should be drawn between extravagance in advertising and enthusiasm in advertising.

Extravagance is really a form of falsehood. It exaggerates the merit of the proposition beyond all reason. The average patent medicine ad is a fair example of this sort of thing. A concern may have a preparation that may be all very good as far as relieving a slight cough may be concerned. But few are content with the business they can do on the strength of this.

Enthusiastic advertising and extravagant advertising are two different things. Enthusiastic advertising is necessary to success. It is based upon a keen appreciation of the merits of the proposition—an appreciation which every advertising man must have before he can really become enthusiastic. It must result in such a manner as to impregnate the "advertisee" with the enthusiasm of the advertiser to the point where he simply cannot resist taking action in the matter.

Possibly the thing that worries the conscientious advertiser more than anything else is the question as to whether or not it is "ethical" to keep silent when silence is the better part of advertising. That is to say, may the advertiser maintain a discreet silence when it comes to drawbacks in his proposition and still feel at peace with the world?

Before answering this in the affirmative, it may be wise to do a little explaining. First of all, no advertiser has any business taking up a proposition and pushing it unless it has merits far in excess of its drawbacks. If it is utterly and undeniably inferior or bad, it is better to drop it altogether and look about for better fields of endeavor.

It is also well to remember that no proposition is perfect. If your proposition is weak in this point, a competing article is almost certain to be weak in some respect in which you are strong. There is this, too, that must also be remembered. What one person may consider a defect, another may consider a merit. So, with all these facts in mind, if he is certain that, everything considered, his proposition is a meritorious one, the conscientious advertising man may feel at perfect liberty to expound its merits enthusiastically.

THE DUTY OF THE CENTRAL STATION TO ADVERTISE.

Getting away from the more practical phases of central-station advertising ethics, let us ask ourselves whether or not, taking into consideration only the highest and most altruistic standards possible, the central station should advertise. To this there is one answer —yes. Electricity, in every possible manifestation of its power, is in keeping with the spirit of the age.

As we suggested at the start, there is a universal movement toward social betterment sweeping the country. The ultimate aim of reformers and thinkers is to enable mankind to realize its fullest possibilities. No one force has had quite so much to do with forwarding these ends as electricity; and, as a distributor of "the greatest agent of progress," the central station should feel it a duty, as well as a privilege, to use the power of advertising to promote the more general adoption of electricity.

Sheboygan Electric Show.

One of the most recent electric shows, conducted by progressive central stations in various localities, was held by the Sheboygan Light, Power and Railway Company, Sheboygan, Wis.

The object, of course, of this show was to further the sale of electric appliances, but particularly to familiarize the residents with the many advantages to be derived from the use of electric service. Some of the latest appliances for stores and industrial establishments were also shown.

From the view of the exterior of the building, it will be noted that the building in which the show was held, which, by the way, was twenty feet by ninety feet, was lighted by means of the two flaming arcs suspended from the roof and with two Luxolaabra, consisting of a cluster of five lamps. The festoon shown in the illustration contains seventy forty-watt tungsten lamps, and was the means of attracting people to the show, and was certainly one of the most attractive features.

INTERIOR OF SHEBOYGAN ELECTRIC SHOW.

Upon entering the building, to the left was located a desk, which was used for registering visitors. In order to make it an object for people to register, twelve prizes were offered and given away at the close of the

show. The prizes included the following: Coffee percolator, flat iron, toaster, portable lamp, curling-iron heater, shaving mug and five mileage books. One of Sheboygan's leading citizens did the drawing and the presents were then exhibited in the company's show room for a few days, after which they were distributed. This scheme resulted in a registration of about 1,500 and supplied enough material to keep the new business board busy for six months in following up some good prospects, as brought out by this registration method.

The interior lighting consisted of various methods to show different designs and different effects. This consisted of four light tungstoilers, concentric diffusers, pendants, etc. Opposite each fixture, and suspended from the ceiling, was a printed card giving the name of the fixture, candle power and cost per hour to burn.

Among other exhibits, were the various kinds of heating devices, electric fireless cookers, washing machines, toasters, flat irons, all of which, of course, were put in actual operation and demonstrated. A motor-driven house pump was also shown, pumping water from a barrel in the cellar into a receptacle in plain view, from where it again flowed, by gravity, into this barrel.

A board consisting of door bells of different chimes was connected with a bell-ringing transformer with buttons, and advertised as the "Costs nothing to run" door bell where electric service is obtainable, due to the fact that the auto-transformer on small bells does not start a meter. This interested the public very much and resulted in several orders.

The meter department moved its entire testing board to the show building and showed the public how to test a meter, read a meter, compare various kinds of lamps.

Mr. Gray of the Holophane Company had charge of the exhibition of Holophane globes and reflectors. Mr. Gillett had an exhibit of the Excess Indicator, demonstrating flat rate lighting. Among the manufacturers who exhibited were the General Electric Company, who had an exhauster, furnace blower, buffing and grinding motors as well as heating devices. The Federal Electric Company had one of its enameled signs on exhibition, and the Simplex Electric Heating Company and the Pacific Electric Heating Company's electrically heated devices were shown.

VIEW OF MAIN ENTRANCE.

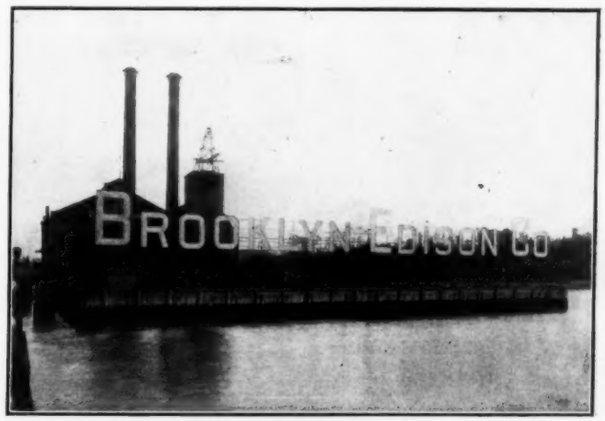
SPECIAL ILLUMINATION FOR SHOW.

Boosting Brooklyn.

The Brooklyn Edison Company has just erected on the dock in front of its Bay Ridge power house, on the lower New York Bay, an electric sign 200 feet long, with capital letters eighteen feet and other letters twelve feet high, on a framework thirty-three feet in height. The sign is illuminated by 1,962-five-watt, ten-volt, multiple tungsten lamps. Alternating current is used, it being stepped down in two transformers from 2,300 to 120, and then to ten volts in sixteen transformers.

The Edison Company advertises this sign as its latest contribution to "Brighter Brooklyn."

NIGHT VIEW OF BROOKLYN SIGN.



DAY VIEW OF BROOKLYN SIGN.

New Electric Sign in Denver.

An electric sky rocket, which shoots up into the air for a distance of 150 feet, explodes and scatters a shower of myriad colored lights to the ground, is Denver's latest novelty in advertising signs. The new electric sign is being installed on the roof of the Davis & Shaw furniture house at the corner of Larimer and Fifteenth streets by the Ellis Electric Sign Company, which has installed over 154 electric signs in Denver and played an important part in making it the "City of Lights." The new sign produces the effect of a sky-rocket, which starts at the first floor of the building, darts up into the air along the five floors and sixty-five feet above the roof to the top of the sign framework. At that point it turns and explodes and then the thousands of sparks go trickling down to the ground. The firm's advertisement is placed in the center of the display.

It takes over 1,000 lamps to illuminate the sign and give the sky-rocket effect. The machine which operates it is twelve feet long and is manipulated by 500 switches which are operated automatically. Current is supplied by the Denver Gas and Electric Company.

A company proposes to display large electric advertising signs in the sea, placed on floats and anchored opposite the beach resorts at Atlantic City.

Co-Operation Between Lamp Manufacturers and Central Stations.

The lamp manufacturers, understanding that every new socket requires another lamp, have set about to increase the demand for electric light by offering to the central stations a series of advertising campaigns to be used in securing new business.

A REAL BUSINESS MAN
That butcher who gives you three steaks and charges for one, has some reason for it. We have a reason for offering you three times the light for the same money, or we couldn't do it. The reason is:
BANNER MAZDA LAMPS
consume only one-third the amount of current that the old style carbon lamps do. Hard to understand? Come in and let us explain. You will be delighted with the brilliant mellow light of the Mazda. Phone today.
UNION LIGHT COMPANY
SAVE THE CHILDREN'S EYES
The PACKARD MAZDA Lamp will light one spot or the whole room with a soft, white, brilliant light, nearly akin to daylight, and for less money than you are spending now.
Give the children's eyes a chance and save your eyes and money.
UNION LIGHT COMPANY
No. 4 Union Street
If they ask for Green, Mr. Storekeeper, give 'em Green
You can match colors absolutely under the light of the COLONIAL MAZDA Lamp, without going out in the street to prove it.
Not only will electric light with the MAZDA Lamp do this, but it gives your whole store a modern and up-to-date look that can be secured with no other illuminant.
Besides you will save money on your lighting bills.
Ask us about it.
UNION LIGHT COMPANY
No. 4 Union Street
You can all read by one Lamp, if it is a Bryan-Marsh Mazda
It will give you three times the light of the old style carbon electric lamp, and at no increase in your current bill.
If you knew, you would use them. The light, too, is much whiter and more healthful.
Call on us to show you.
UNION LIGHT COMPANY
No. 4 Union Street

SAMPLES OF LAMP ADVERTISEMENTS FOR CENTRAL STATIONS.

The plan represents an unusual investment of money, time, and labor. The campaigns are, for the most part, devoted to residence lighting, but touch on commercial and industrial lighting. They are so designed as to cover the great variety of central-station conditions. Some fifty pieces of direct advertising in the form of booklets, fold-

ers, form letters, postal cards, etc., and about forty newspaper advertising designs have been collected. Every possible contingency in the way of peculiar local conditions has been provided for. In order to break away from any appearance of stock advertising, space has been left in the body of the copy for the signature of the central station company which is to distribute the matter. Certain space is also allowed for special propositions such as many central stations are offered on wiring contracts.

Brightness and Beauty in the home
Electric Light is the Artistic Light and costs no more than any other kind
A Noted Oculist Says
LOOK INSIDE THE ENVELOPE AS WELL AS ON THE BACK OF THIS CARD
"It's a Big Thing For You"
Says The Mailman
Yours for Light Housekeeping

A FEW EXAMPLES OF LAMP LITERATURE FOR MAILING.

The accompanying illustrations show typical samples of the matter. It will be noted that the thought in preparing this advertising was not so much to advertise a particular make of lamp as it was to boost electric lighting in general, and to plead earnestly for the whole cause of the central station.

The manufacturers entering into this co-operative scheme include the member companies of the National Electric Lamp Association, the General Electric Company, the Westinghouse Lamp Company, and the Franklin Electric Manufacturing Company.

New York Edison Company's Calendar

Following its scheme of sending out quarterly calendars advertising electric service, the New York Edison Company recently distributed attractively designed pages for the months of August, September, and October. The calendars are attractively designed and each page carries an illustration of some popular application of electricity; those for this quarter being the fan, automobile and massage.

Big White Rock Water Sign.

Vessels on the lake approaching Chicago have a new light at night to guide them in finding the direction of the city and the entrance into the harbor. This is the mammoth electric sign recently erected at the north end of Grant Park, topping the building at the corner of Michigan avenue and Randolph Street. High above the surrounding buildings, so that it can be seen for miles, both over lake and land, the sign sets forth in electric letters the merits of White Rock Water.

The sign is built on a steel framework that is made to withstand the utmost strength of the gales of wind that blow in the upper air. It is claimed that the sign can be seen farther than any other light from the city of Chicago.

How to get Undeveloped Central-Station Business.

A valuable little booklet bearing this caption is being distributed to central stations by the Electric Storage Battery Company, of Philadelphia, and is a striking example of the assistance being offered central stations by the manufacturers.

The undeveloped business is, of course, the electric vehicle and attention is called to the enormous field in this direction. The booklet is full of valuable, unbiased suggestions which will materially benefit any company desiring light on this phase of new business.

A letter written by W. H. Blood, Jr., embodied in this booklet pointing out how central stations may obtain electric vehicle business is abstracted herewith:

"At the present time comparatively few central-station managers know very much about the electric vehicle. The manager should write to all of the principal manufacturers of vehicles and batteries and get from them their printed literature. After familiarizing himself with this he should then turn it over to someone in his contract department who will look after the development of this business. He should also appoint someone in his operating force who has had experience with the charging of batteries, preferably; if not, some young man who is willing to learn, who will make a study of this matter, and will visit nearby towns where batteries are charged. He should next purchase for his own use an electric runabout to be used for city service in making business and personal calls. He should also purchase for his company an electric truck to be used for the company's work as far as possible. After his men are thoroughly familiar with charging the battery and operating the car he should then loan it to some reputable concern which does a considerable amount of teaming. During this period careful records, of course, should be kept of the cost of current, mileage, repairs, etc. He should install in some convenient place a charging outfit and after having this in good operating condition he should let the public know that he is prepared to charge the batteries for electric vehicles. He should then make the office of the central station a bureau of information in regard to electric vehicles."

Signs in Massillon.

The Massillon Electric and Gas Company, Massillon, Ohio, is conducting a very energetic campaign for sign business. The merchants are taking to electric signs and contracts have been closed with the banks for attractive displays. Even the churches are favorably considering the proposition.

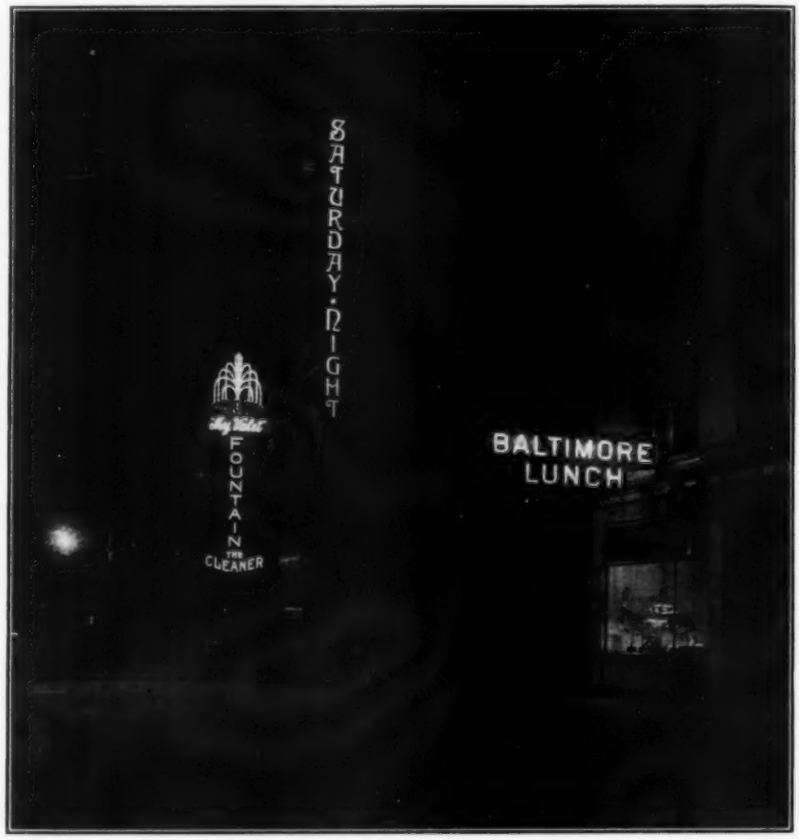
Electricity in the Home.

Under this caption, the Philadelphia Electric Company, Philadelphia, Pa., is distributing an attractive booklet pointing out the many uses of electricity in the home. A vast line of appliances are treated, and in each case the initial cost, cost of current and other details are given. Several illustrations are shown which emphasize the simplicity of the appliances described.

The council of Hampstead (London, England) has ordered the substitution of 802 street gas lamps by the incandescent electric system.

Electric Signs in Toronto.

One of the most novel electric signs ever erected in Canada has been hung on the facade of a building on Adelaide Street, West, for Fountain, the Cleaner. The word "Fountain" is in eighteen-inch letters, running perpendicularly, while at the bottom are the words "The Cleaner," in sixteen-inch letters. Across the top are the words "My Valet." Over all is an immense electric fountain. This sign was built by Death & Watson, after the design was submitted to Mr. Fountain by one of the sign experts of the sales department of the Toronto Electric Light Company, Limited. The sign is attracting a great deal of attention, and for the amount of circulation secured is far cheaper than any other advertising medium that Mr. Fountain could employ.



VIEW OF ELECTRIC SIGNS IN TORONTO.

Other novel signs are fast being installed and Toronto, due to the energetic policy of the sales department of the Toronto Electric Light Company, Limited, bids fair to become famous for its signs, a few of which are shown above.

TELEPHONY—TELEGRAPHY, and WIRELESS.

The Use of High-Frequency Currents for Sending Messages Over Power Transmission Lines.

A paper on this interesting subject was read at the International Congress of Applied Electricity, in Marseilles, France, by L. Neu. In long distance power transmission installations it is of great importance to maintain communication between the power station and the various centers supplied with high-tension current.

Generally this is accomplished by means of a telephone wire carried by the poles of the transmission line. Such an installation is expensive and offers manifold dangers in case of a contact between telephone and high-tension conductors, and it would be desirable to employ the power-transmission conductors themselves for the purpose of communication. This is possible by the use of high-tension, high-frequency currents; for a condenser inserted in the circuit will permit the passage of an amount of energy proportional to

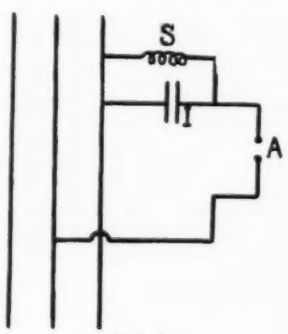


FIG. 1.

the frequency of the current. Furthermore, the energy transmitted by an inducing to an induced circuit is, other conditions being equal, a function of the frequency.

The sending station (Fig. 1) contains an adjustable spark-gap, *A*, of the kind employed in wireless telegraphy, connected in parallel with two of the conductors through a self-induction, *S*. The high-frequency current produced is sent into the line by a shunt connection which contains a condenser, *I*. The coil, *S*, prevents the passage of the high-frequency current, while the condenser almost completely obstructs the low-frequency current of the line.

The receiving station (Fig. 2) contains a spark-gap, *B*, in parallel with

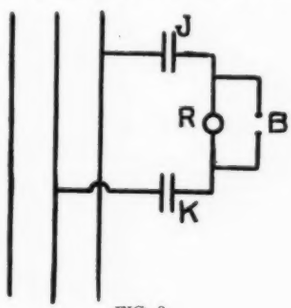


FIG. 2.

the spark-gap, *A*, at the transmitting station. The receiving circuit also comprises two condensers in series, *J*, *K*, which are intended for obstructing the low-frequency and permitting the passage of the high-frequency current. To the poles of the spark-gap a thermal or other relay may be connected, which upon the generation of high-frequency currents closes the auxiliary circuit of a battery serving for the operation of an alarm bell or other device. The signals may be registered on a paper band between the electrodes of the spark-gap. An electrostatic relay or electrolytic detector may be employed in place of the spark-gap.

By means of a switch, as *G* in Fig. 3, the circuits may be easily arranged for receiving as well as sending signals. The switch may be connected so that it automatically resumes the receiving position and also sends signals upon the interruption of the service. This system has been tested on a 5,000-volt three-phase line between Valenciennes and Blanc-Miseron. — *Translated from Electrotechnischer Anzeiger, Berlin, Germany, June 2, 1910.*

Wireless Telegraphy in New Zealand.

The wireless telegraphy plant, for which tenders are being invited by the New Zealand Government, says the London *Times*, is for two high-power and three medium-power stations. One of the former is to be located near Doubtless Bay, in the northern part of the North Island, and the other near Bluff, at the extreme south of the South Island. These two stations are to have a maximum range oversea of 1,250 nautical miles, and are to be capable of signaling with the high-power station that is being installed by the Australian Commonwealth near the entrance to Sydney Harbor, and with each other. They are also to be capable of receiving calls from Fiji, from men-of-war at long and short distances, and from commercial vessels. The high-power station at Doubtless Bay is to be the first to be erected. The three medium-power stations are to be erected at Cape Farewell, Gisborne, and at Sumner (near Christchurch). They re to have a range oversea of 500

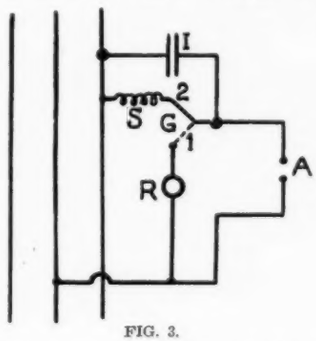


FIG. 3.

nautical miles. Systems suitable for wireless telephone as well as telegraphy are to receive consideration.

Receiver for Telephone Company.

The Western Telephone Manufacturing Company has been placed in the hands of the American Trust and Savings Bank as receiver, on application of its creditors. The company had debts amounting to over $18,000, while its assets were about $7,000.

The History of the Telephone.

The Telephone in Foreign Countries—II.

BY HERBERT N. CASSON.

Russia and Austro-Hungary have now about 125,000 telephones apiece. They are neck and neck in a race that has not at any time been a very fast one. In each country the Government has been a neglectful stepmother to the telephone. It has starved the business with lack of capital and used no enterprise in expanding it. Outside of Vienna, Budapest, St. Petersburg and Moscow there are no wire systems of any consequence. The political deadlock between Austria and Hungary shuts out any immediate hope of a happier life for the telephone in those countries; but in Russia there has recently been a change in policy that may open up a new era. Permits are now being offered to one private company in each city, in return for three per cent of the revenue. By this step Russia has unexpectedly swept to the front and is now, to telephone men, the freest country in Europe.

H. C. CEDERGREN.

In tiny Switzerland there has been Government ownership from the first, but with less detriment to the business than elsewhere. Here the officials have actually jilted the telegraph for the telephone. They have seen the value of the talking wire to hold their valley villages together; and so have crisscrossed the Alps with a cheap and somewhat flimsy system of telephony that carries 60,000,000 conversations a year. Even the monks of St. Bernard, who rescue snow-bound travelers, have now equipped their mountain with a series of telephone booths.

The highest telephone in the world is on the peak of Monte Rosa, in the Italian Alps, very nearly three miles above the level of the sea. It is linked to a line that runs to Rome, in order that a Queen may talk to a professor. In this case the Queen is Margherita of Italy and the professor is Signor Mosso, the astronomer, who studies the heavens from an observatory on Monte Rosa. At her own expense, the Queen had this wire strung by a crew of linemen, who slipped and floundered on the mountain for six years before they had it pegged in place. The general situation in Italy is like that in Great Britain. The Government has always monopolized the long distance lines, and is now about to buy out all private companies. There are only 55,000 telephones to 33,000,0000 people, as many as in Norway and less than in Denmark. And in many of the southern and Sicilian provinces the jingle of the telephone bell is still an unfamiliar sound.

The main peculiarity in Holland is that there is no national plan, but rather a patchwork that resembles Joseph's coat of many colors. Each city engineer has designed his own type of apparatus and had it made to order. Also, each company is fenced in by law within a six-mile circle, so that Holland is dotted with thumb-nail systems, no two of which are alike. In Belgium there has been a Government system since 1893, hence there is unity, but no enterprise. The plant is old-fashioned and too small. Spain has private companies, which give fairly good service to 20,000 people. Roumania has half as many. Portugal has two small companies in Lisbon and Oporto. Greece, Servia and Bulgaria have a scanty 2,000 apiece. The frozen little isle of Iceland has one-quarter as many, and even in Turkey, which was a Forbidden Land under the regime of the old Sultan, the Young Turks are importing boxes of telephones and coils of copper wire.

There is one European country, and only one, which has caught the telephone spirit—Sweden. Here telephony had a free swinging start. It was let alone by the Post Office; and, better still, it had a Man, a business-builder of remarkable force and ability, named Henry Cedergren. Had this man been made the Telephone-General of Europe, there would be a different story to tell. By his insistent enterprise he made Stockholm the best telephoned city outside of the United States. He pushed his country forward until it stood fourth among European nations, having 165,000 telephones. Since his death the Government has entered the field with a duplicate system, and a war has been begun which grows yearly more costly and absurd.

Asia, as yet, with her 850,000,000 people, has fewer telephones than Philadelphia, and three-fourths of them are in the tiny island of Japan. The Japanese were enthusiastic telephonists from the first. They had a busy exchange in Tokio in 1883. This has now grown to have 25,000 users, and might have more if it had not been stunted by the peculiar policy of the Government. The public officials who operate the system are able men. They charge a fair price and make 10 per cent profit for the State. But they do not keep pace with the demand. It is one of the oddest vagaries of public ownership that there is now in Tokio a *waiting list* of 8,000 citizens, who are offering to pay for telephones and cannot get them. And when a Tokioan dies, his franchise to a telephone, if he has one, is usually itemized in his will as a $400 property.

India, which is second on the Asiatic list, has no more than 9,000 telephones. One to every 33,000 of her population! Not quite as many, in fact, as there are in five of the skyscrapers of New York. The Dutch East Indies and China have only 7000 apiece, but in China there has recently come a Forward Movement. A fund of $20,000,000 is to be spent in constructing a national system of telephone and telegraph. Pekin is now pointing with wonder and delight to a new exchange, spick and span, with a couple of 10,000-wire switchboards. Others are being built in Canton, Hankow and Tien-Tsin. Ultimately, the telephone will flourish in China, as it has in the Chinese quarter of San Francisco. The Empress of China, after the siege of Pekin, commanded that a telephone should be hung in her palace, within reach of her dragon-throne; and she was very friendly to any representative of the "Speak Lightning Sounds" busi-

ness, as the Chinese term telephony.

In Persia the telephone made its entry recently in true comic-opera fashion. A new Shah, in an outburst of confidence, set up a wire between his palace and the market-place in Teheran, and invited his people to talk to him whenever they had grievances. And they talked! They talked so freely and used such language that the Shah ordered out his soldiers and attacked them. He fired upon the new Parliament, and was at once chased out of Persia by the enraged people. From this it would appear that the tetlephone ought to be popular in Persia, although at present there are not more than twenty in use.

South America, outside of Buenos Ayres, has few telephones, probably not more than 30,000. Dom Pedro of Brazil, who befriended Bell at the Centennial, introduced telephony into his country in 1881; but it has not in thirty years been able to obtain 10,000 users. Canada has exactly the same number as Sweden—165,000. Mexico has perhaps 10,000; New Zealand, 26,000; and Australia, 55,000.

Far down in the list of continents stands Africa. Egypt and Algeria have 12,000 at the north; British South Africa has as many at the south; and in the vast stretch between there are barely a thousand more. Whoever pushes into central Africa will still hear the beat of the wooden drum, which is the clattering sign-language of the natives. One strand of copper wire there is, through the Congo Region, placed there by order of the late King of Belgium. To string it was probably the most adventurous piece of work in the history of telephone linemen. There was one 750-mile stretch of the central jungle. There were white ants that ate the wooden poles, and wild elephants that pulled up the iron poles. There were monkeys that played tag on the wires, and savages who stole the wire for arrow-heads. But the line was carried through, and today is alive with conversations concerning rubber and ivory.

So we may almost say of the telephone that "there is no speech nor language where its voice is not heard." There are even a thousand miles of its wire in Abyssinia, and 150 miles in the Fiji Islands. Roughly speaking, there are now 10,000,000 telephones in all countries, employing 250,000 people, requiring 24,000,000 miles of wire, representing a cost of $1,500,000,000, and carrying 19,000,000,000 conversations a year. All this, and yet the men who heard the first feeble cry of the infant telephone are still alive and not by any means old.

No foreign country has reached the high American level of telephony. The United States has *eight* telephones per 100 of population, while no other country has one-half as many. Canada stands second, with almost four per 100; and Sweden is third. Germany has as many telephones as the State of New York; and Great Britain as many as Ohio. Chicago has more than London, and Boston twice as many as Paris. In the whole of Europe, with her twenty nations, there are one-third as many telephones as in the United States. In proportion to her population, Europe has only one-thirteenth as many.

The United States writes half as many letters as Europe, sends one-third as many telegrams, and talks twice as much at the telephone. The average European family sends three telegrams a year, and three letters and one telephone message a week; while the average American family sends five telegrams a year, and seven letters and eleven telephone messages a week. This one nation, which owns six per cent of the earth, and is five per cent of the human race, has *seventy* per cent of the telephones. And fifty per cent, or one-half, of the telephony of the world is now comprised in the Bell system of this country.

There are only six nations in Europe that make a fair showing—the Germans, British, Swedes, Danes, Norwegians and Swiss. The others have less than one telephone per 100. Little Denmark has more than Austria. Little Finland has better service than France. The Belgium telephones have cost the most—$273 apiece, and the Finnish telephones the least—$81. But a telephone in Belgium earns three times as much as one in Norway. In general, the lesson of Europe is this, that the telephone is what a nation makes it. Its usefulness depends upon the sense and enterprise with which it is handled. It may be either an invaluable asset or a nuisance.

Too much Government! That has been the basic reason for failure in most countries. Before the telephone was invented, the telegraph had been made a State monopoly; and the telephone was regarded as a species of telegraph. The public officials did not see that a telephone system is a highly complex and technical problem, much more like a piano factory than a steel mill. And so, wherever a group of citizens established a telephone service, the Government officials looked upon it with jealous eyes, and usually snatched it away. The telephone thus became a part of the telegraph, which is a part of the Post Office, which is a part of the Government. It is a fraction of a fraction of a fraction—a mere twig of bureaucracy. Under such conditions the telephone could not prosper. The wonder is that it survived.

Handled on the American plan, the telephone abroad may be raised to American levels. There is no racial reason for failure. The slow service and the bungling are the natural results of treating the telephone as though it were a road or a fire department; and any nation that rises to a proper conception of the telephone, that dares to put it into competent hands and to strengthen it with enough capital, can secure as alert and brisk a service as heart can wish. Some nations are already on the way. China, Japan and France have sent delegations to New York City—"the Mecca of telephone men"—to learn the art of telephony in its highest development. And even Russia has rescued telephony from her bureaucrats and is now offering it freely to men of enterprise.

In most foreign countries telephone service is being steadily geared up to a faster pace. The craze for "cheap and nasty" telephony is passing; and the idea that the telephone is above all else a *speed* instrument, is gaining ground. A faster long-distance service, at double rates, is being well patronized. Slow-moving races are learning the value of time, which is the first lesson in telephony. Our reapers and mowers now go to seventy-five nations. Our street-cars run in all great cities. Morocco is importing our dollar watches; Korea is learning the waste of allowing nine men to dig with one spade. And all this means telephones.

In thirty years, the Western Electric Company has sold $67,000,000 worth of telephonic apparatus to foreign countries. But this is no more than a fair beginning. To put one telephone in China to every 100 people will mean an outlay of $300,000,000. To give Europe as fit an equipment as the

United States now has will mean 30,000,000 telephones, with copper wire and switchboards to match. And while telephony for the masses is not yet a live question in many countries, sooner or later, in the relentless push of civilization, it must come.

Possibly, in that far future of peace and good-will among nations, when each country does for all the others what it can do best, the United States will be generally recognized as the source of skill and authority on telephony. It will be called in to rebuild or operate the telephone systems of other countries, in the same way that it is now supplying oil and steel rails and farm machinery. Just as the wise buyer of today asks France for champagne, Germany for toys, England for cottons and the Orient for rugs, so he will learn to look upon the United States as the natural home and headquarters of the telephone.

[EDITOR'S NOTE.—This is the sixth part of a series of telephone articles by Mr. Casson on the History of the Telephone. Chapter II of "The Telephone in Foreign Countries" will be followed by an article on "Litigation Over the Telephone," in two parts.]

Armored Cable Laid in Chesapeake Bay.

Five miles of armored submarine cable, containing sixteen pairs of wire, has just been laid by the Bell Telephone Company of Pennsylvania beneath the waters of the Chesapeake Bay. The cable is one of the best ever designed and its preparation occupied the attention of a corps of expert engineers for some little time.

When this cable left the New York plant of the Western Electric Company, consigned to the Bell Telephone Company of Pennsylvania, it was in four sections, each section strung on an immense reel. Each of these sections consisted of 6,600 feet of cable, and each spool with its load weighed 58,000 pounds.

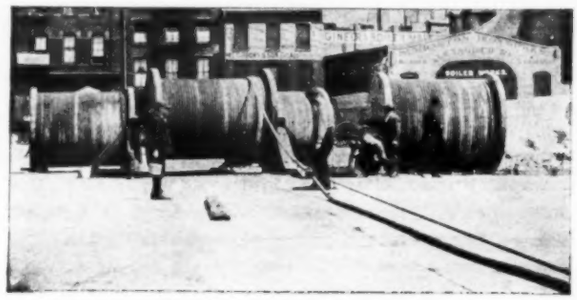
The cable with its armor was about 2.5 inches in diameter. A lead sheath which served for protection was 0.156 inch in thickness. This cover was wrapped with three reverse layers of jute and then armored with lengths of wire about 0.25 inch in diameter. Over this were then placed two layers of jute.

The cable was taken from its four reels at the dock on West Street, New York, and wound in a "figure eight" on board the barge. It proceeded to its destination in Chesapeake Bay without any mishap and the work of installing the cable in its final resting place was begun immediately upon its arrival.

Shipping and laying this cable, because of its great weight and length, was a tremendous undertaking. A start was made from the east shore and the end of one section was buoyed in the bay. The other three lengths, which had already been spliced together into one piece nearly four miles in length, were laid from the west shore. The free end of this section was then spliced to the first quarter at the meeting place in the bay.

The sixteen pairs of wire which this cable contains will serve telephone subscribers in Delaware and on the eastern shores of Maryland and Virginia with excellent connections through to Baltimore and the rest of Maryland.

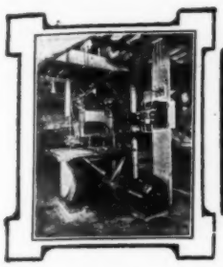
The cable makes conversation from Baltimore to Cape Charles and other peninsular points equivalent to a conversation over a land line fifty miles shorter than by way of the route previously used. The Bell Telephone Company of Pennsylvania has run additional wires to the terminals of this cable from points in the southern part of the eastern shore peninsula and from Baltimore and Annapolis.



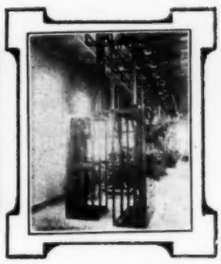
VIEW OF THE FOUR GREAT REELS.

LANDING EAST SHORE END OF CABLE.

The accompanying illustrations are some snapshots of the operations of shipping and laying this cable. The pictures show the manner in which the work on the shores of the bay was done, with a number of barges placed in position to receive the enormous weight as it was spun out from its position on the larger boat.



Industrial Power

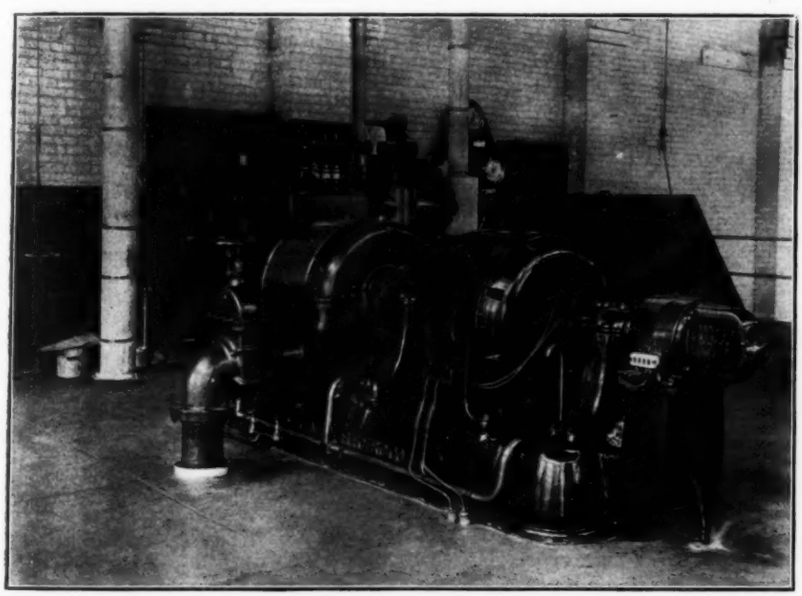


ELECTRIFICATION OF CHESAPEAKE & OHIO NORTHERN RAILROAD SHOPS AT HUNTINGTON, W. VA.

L. W. HOUSEHOLDER.

The Chesapeake & Ohio Railroad Company has recently changed its shops at Huntington, W. Va., from line-shaft drive by reciprocating engines to electric drive, thereby utilizing the greater flexibility and efficiency of the electric drive in addition to effecting a great saving in space and operating expenses.

The shops were formerly operated from four independent stations equipped with locomotive boilers and reciprocating engines belted to line shafts in the different shops and also to one Thomson-Houston arc machine which supplied power to a few open-arc lamps about the shops and roundhouse.



THE 100-KILOWATT CURTIS TURBINE, CHESAPEAKE & OHIO RAILROAD SHOPS.

The new station is an all-turbine station, the only reciprocating machinery besides the boiler feed-pumps being two two-stage air compressors built by the Ingersoll-Rand Company, and the Chicago Pneumatic Tool Company, which furnish compressed air at 100 pounds pressure for the pneumatic drills, hammers, and hoists about the shops. Three Curtis steam-turbines and one motor-generator exciter have been installed. The reliability, safety and high efficiency of these turbines, when operating at a varying load such as that of a machine shop, led to their selection for this purpose.

The turbine equipment consists of the following units: One two-bearing, overhung, noncondensing turbine, speed 3,600 revolutions per minute, connected to a twenty-five kilowatt, 125-volt direct-current exciter; one four-bearing, three-unit, 100-kilowatt set consisting of one noncondensing turbine, speed 2,600 revolutions per minute; one three-phase, sixty-cycle, 480-volt, 100-kilowatt generator and one 4-kilowatt, 125-volt direct-current exciter; one three-bearing four-stage condensing turbine, speed 1,800 revolutions per minute, connected to a 750-kilowatt, three-phase, sixty-cycle generator.

All of these turbines are equipped with oil pumps geared direct to the main shaft of the turbine, and the bearings are fitted with oil rings. The 750-kilowatt and 100-kilowatt turbines are equipped with crosshead mechanical valve-gear driven direct from the main turbine shaft.

The 750-kilowatt turbine is connected to a Westinghouse Le Blanc jet-condenser, the circulating and rotary air-pumps of which are driven by a seventy-five horsepower induction motor. The injection water is cooled by a natural-draft cooling tower. This arrangement is very satisfactory as it maintains a vacuum of twenty-seven to twenty-eight inches.

The boiler equipment consists of five 275-horsepower Stirling water-tube boilers which are equipped with shaking grates and are hand-fired. The ash is shoveled from the ash pits into cars and conveyed to a dump. The smokestack is of reinforced concrete, 200 feet high, and is provided with a Bushnell damper regulator. Bituminous coal is used and it is delivered in railroad cars on a trestle just outside of the boiler room and is dumped into coal bunkers and conveyed through chutes to a point within easy reach of the firemen.

The condensing and boiler feed-water is supplied from a pumping station located outside of the shops. The feed water is pumped from an open-feed water-heater to the boilers by two duplex pumps, manufactured by the Platt Iron Works Company. The piping is so arranged that the feed water may be pumped direct from the hot well of the cooling tower.

The engine room is spanned by a seven one-half ton Harris hand crane.

The switchboard is of standard General Electric manufacture, and consisting of eight dull-finished slate panels, two machine panels, two exciter panels, four three-circuit feeder panels, and

one half panel on which a voltage regulator is mounted. The instruments are of the General Electric standard switchboard type.

About 1,000 horsepower of General Electric induction motors are distributed throughout the planing mill, tin shops, pipe shops, machine shop, boiler-shop and roundhouse. These range from fifteen to 100 horsepower each and are used to drive the different tools, such as band saws, wood planes, lathes, circular saws, drill presses, boring mills, shapers, metal puncher and rolls. Most of the motors are belted to a section of lineshafting from which the various tools are belt-driven. The large planers, turning lathes, drill presses, and boring mills are equipped with individual-motor drive.

The planing mill is equipped with a sawdust and shaving eliminator driven by a 100-horsepower induction-motor which conveys the shavings through tubes into the furnace under the boilers.

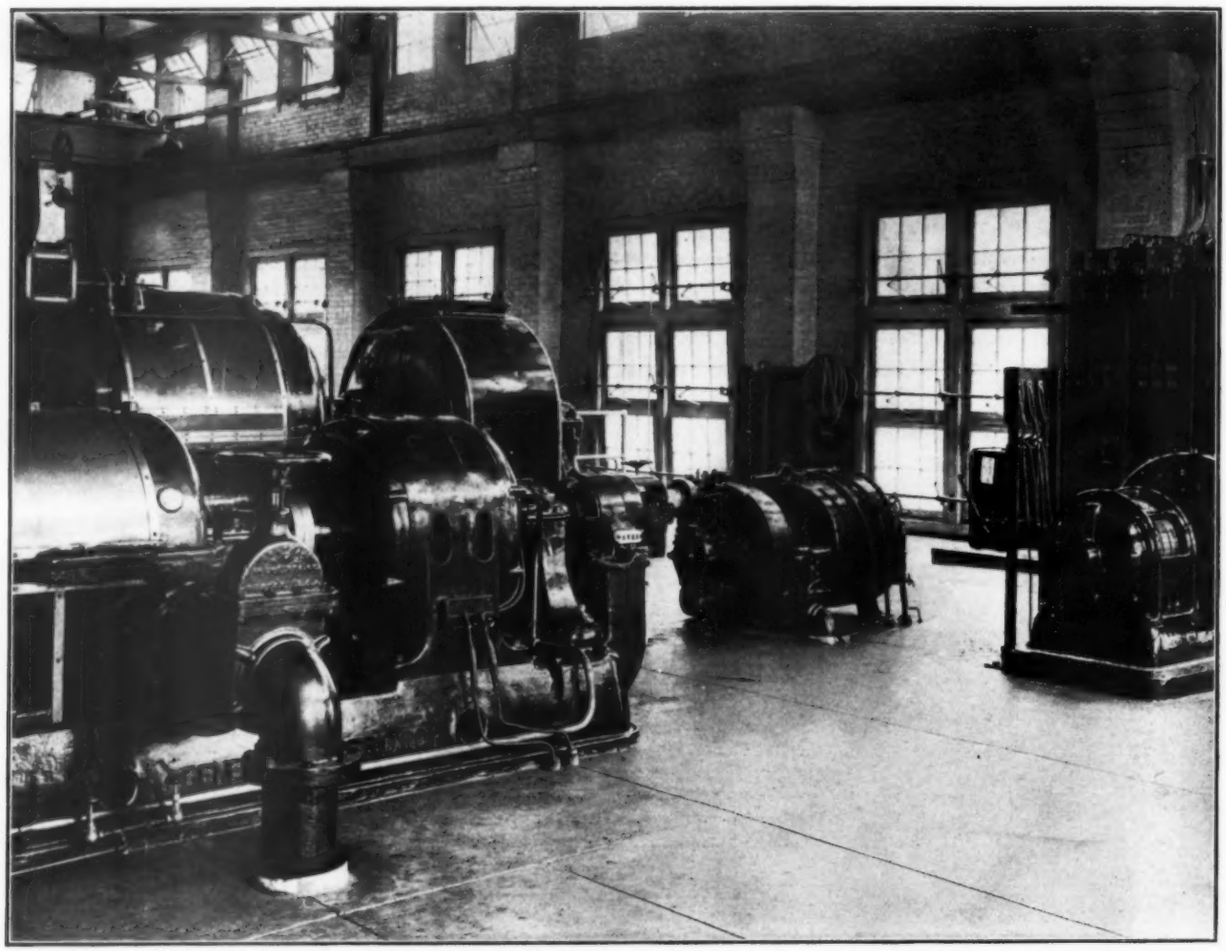
The station for charging storage batteries for signals and passenger coaches is equipped with a motor-generator set.

The dismantling shop is spanned by a 120-ton four-hook electric crane manufactured by the Harris Crane Company, and equipped with four variable-speed induction motors of the slip-ring type.

The buildings are heated by the exhaust steam from the two air compressors, boiler-feed-pumps, twenty-five kilowatt and 100-kilowatt turbines, and the condensation from the system is pumped into the boiler-feed-water heater. This arrangement puts a back pressure on the exhaust header of from four to eight pounds.

The changes made in this plant brought about a saving in coal alone of fifty per cent, which saving will be effected in part by the low steam consumption of the turbines and in part by the obliteration of large shafting and belting losses due to the introduction of a system of motor drive. They also effected a saving of two-thirds in the labor required to operate the plant. This is due partly to the improved methods of handling coal and ash and partly to the small number of men required to operate a turbine station. Besides the saving in the cost of coal and labor, they have greatly increased the capacity of their shops, as they are now able to overhaul and rebuild one locomotive a day, whereas twenty was a good month's work previously. During the month of April thirty-four locomotives were turned out, this being the largest number ever repaired in one month. The electric drive has also increased the flexibility of the shops, as any section can be started independently of the rest. Power is always available and the shops are very well lighted, so workmen can work at night to advantage. The new plant was put in service on March 1, 1910.

The engineering was done by Westinghouse, Church, Kerr & Company.



CURTIS TURBINES IN THE CHESAPEAKE & OHIO RAILROAD SHOPS—25, 100 AND 750 KILOWATTS CAPACITY.

Electric Truck on the Farm.

The illustration shown below demonstrates the value of the electric truck even on the farm, which might perhaps be regarded as the last stronghold of the horse.

This truck is the standard 3.5-ton truck manufactured by the General Vehicle Company, and was sold through the Rochester Railway and Light Company to Brown Brothers, who conduct a nursery about four miles from Rochester, N. Y. The truck is used during the shipping season for delivering trees and shrubs to the depot, and returns loaded with fertilizer and supplies for the nursery.

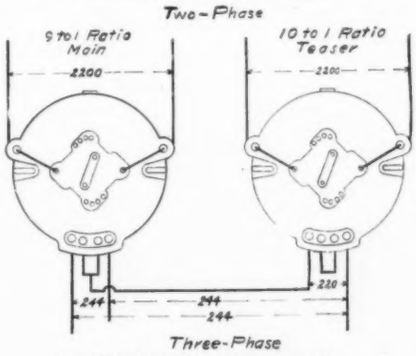
During the harvest season this truck was used for the harvesting of the hay crop, and, as shown in the illustration, for the harvesting of the wheat crop. The truck as shown has 617 bundles of wheat, which after being threshed, yielded forty-five bushels. The regular two-horse load shown has 260 bundles. Where the time element is so important, due to uncertain weather conditions, the use of the power vehicle is a great advantage.

ELECTRIC TRUCK HARVESTING WHEAT.

Two- to Three-phase Transformation With Standard Transformers.

It is frequently desirable to operate three-phase motors from a two-phase circuit. Almost any handbook or textbook will tell you that this may be done using Scott transformation. The book will proceed to tell you that it is necessary to have the "Three-phase coils of one transformer designed for 100 volts while the three-phase coils of the other transformer must be designed for 86.6 volts, or in that ratio." Such information is of but little value when a three-phase motor must be connected to a two-phase circuit, and connected in a hurry.

The accompanying diagram shows a



TRANSFORMER CONNECTIONS.

connection which has been made frequently with standard Hawthorn transformers. A 1100/2200-volt primary, 122/244-volt secondary, (ratio 9 to 1) transformer connected as "main" with 1100/2200-volt primary, 110/220-volt secondary, (ratio 10 to 1) transformer connected as "teaser" may be recommended to operate a 220-volt three-phase motor on a 2200 volt two-phase supply. The secondary voltage given by this arrangement is 244 volts three-phase, but, allowing for line drop, etc., it is a satisfactory voltage on which to operate 220-volt motors. The unbalance and increase in heating are negligible.

The Western Electric Company's Hawthorn transformers are well suited to this work, the four secondary leads which are brought out on all of them, in order to make possible either of two secondary voltage connections, are a great convenience in making the two-phase to three-phase connections.

An Electric Hot-Plate.

The use of an electric hot-plate has contributed greatly to the improved conditions under which most chemical laboratory work is conducted today. It is continually growing in favor. A description of such a plate, devised and constructed in the laboratory of the Empire Zinc Company, Canon City, Colo., is given by *Metallurgical and Chemical Engineering*.

The plate is thirty-four by seventeen inches and has a thin sheet-iron base, on which is a piece of asbestos board one-quarter of an inch thick. This is covered with sheet mica, on which rest the heating coils. Above the latter is additional insulation in the shape of sheet mica. Finally, the top, which is of one-half-inch planed cast iron, completes the apparatus. The whole can conveniently be placed on standards of any desired height, and forms a plate about two inches thick and of the area given above.

The construction of the heating coils is the interesting feature of this plate. They consist of fire-clay bars with No. 18 German silver wire. They are 15⅞ inches long and triangular in cross-section. The section measures 1¼ by ¾ inches, the larger dimension being the base of the triangle and the smaller its height from base to apex.

The rods are wound in pairs and there are four pairs in the plate. They are laid with their length extending the width of the plates, and are spaced about four inches center to center. Four switches are provided, one for each pair of rods, so that different sections of the plate may be used as needed. Each of the end pairs of rods is wrapped with seventy-three feet of wire, while each of the middle pairs is wrapped with seventy-five feet. For convenience in getting at the coils, the top is made readily removable, being attached to the base by bolts. It is estimated that 2,000 chemical determinations are made on a consumption of about 500 kilowatt-hours per month. For ten months the average consumption has been 524 kilowatt-hours.

STREET-LIGHTING SCHEDULES.—Please tell me how many hours per year street lamps would burn under the following schedules: (1) All night every night; (2) all night moonlight; (3) every night till twelve o'clock; (4) moonlight twelve o'clock.—R. F., Yankton, S. D.

(1) The all-night every-night schedules vary somewhat, depending on the time, relative to sunset and sunrise, that the lights are specified to be switched on and cut off. The schedule coming into perhaps most extensive use calls for an average of 4,000 hours per year, which corresponds closely to the lamps being lighted one-half hour after sunset and extinguished one-half hour before sunrise, and gives an average of eleven hours per day. Another schedule cuts the lights off at one hour before sunrise, which gives 3,830 hours per year. Other schedules call for 3,760, 3,915, 4,100 and 4,200 hours per year. (2) The most common and best established moonlight schedule is that known as the Philadelphia moonlight schedule. It requires the lamps to be lighted one-half hour after sunset and one hour before moonset, and extinguished one hour after moonrise and one hour before sunrise; on the night of full moon, the night before and the night after full moon the lamps are not lighted. Because the lunar month does not coincide with the calendar month, there are sometimes twelve and sometimes thirteen full moons in the calendar year. This affects the number of hours the lamps are lit per year; for instance, in 1910 the Philadelphia schedule calls for practically 2,200 hours, in 1909 it was 2,108 hours. (3) On the basis of 4,000 hours for all-night every-night sevice, as explained in (1), the lighting of the lamps every night till midnight only requires about 2,000 per year. (4) If the Philadelphia moonlight schedule is followed until midnight and no light furnished after that hour, it will mean 1,170 hours of lamp service this year. In 1909 the number was 1,115.

VELOCITY OF RADIANT ENERGY; OPEN-DELTA TRANSFORMERS.—(1) What is the speed in miles per second of light, heat, sound, electricity and magnetism? (2) Is it good practice to conect up two single-phase transformers in series to get a three-phase current? What are its disadvantages and how does it compare with the use of three single-phase transformers or one three-phase transformer?—C. O. S., San Bernardino, Cal.

(1) It has been found that radiant heat and electromagnetic waves travel at the same velocity as those of light. The most accurate determination of the velocity of light (that by Professor Michelson) gave the value 186,270 miles per second. The velocity of sound in air at a temperature of zero centigrade is 1,088.2 feet per second. In water the velocity of sound is 4.3 times as great; in copper 11.2 times, in iron 15.1 times, in lead 4.2 times, in glass 15.3 times as great as in air. (2) Two single-phase transformers can be connected up in two different ways for use on a three-phase circuit. The one quite commonly used in the West is what is known as the "open-delta" connection, in which the two primary coils are joined in series and then the two open terminals and the joint terminal connected to the three terminals of the three-phase source. The two secondaries are similarly connected to the load. This connection is sometimes also called the V-connection. It is not so satisfactory a connection as either the delta (Δ) or star (Y) connections, but is used either for emergency or because it is desired to save the intial cost of a third transformer. Its chief disadvantage is that it produces a marked unbalance of the secondary voltages and of the primary currents. As compared with the use of three single-phase transformers, each of the same size as those used in the V-connection, it has a lower efficiency and lower load capacity, but represents only two-thirds as great an initial investment. The same is practically true as compared to a three-phase transformer. A disadvantage of the V-connection for regular service is that in case of damage to one of the two transformers, three-phase service is entirely interrupted, whereas when three single-phase transformers, or one three-phase transformer delta-connected, are used an accident to one coil does not cripple the service, because the set can continue to serve as an open-delta group. By using the so-called T-connection, two transformers can be used in three-phase service without nearly as great disadvantages as are involved in the open-delta method.

BLOCK-LIGHTING PERMITS.—Is it necessary to get a special city permit to enable us to sell current from our plant to neighbors in the same block?—F. R., Cincinnati, Ohio.

If it is possible to run the feed wires necessary to provide this supply in such a way that they do not run along, over or under any street, alley or other public way, no special permit is probably necessary, provided the wires are installed in a way to meet the approval of the city inspection department. But if the wires have to be run along, over or under any street or alley, a special ordinance of the city council permitting this is necessary.

MEASURING CURRENT WITH A POTENTIOMETER.—I understand that the potentiometer is an instrument used in measuring potential; in fact, its name suggests as much. How then is it possible to measure current by means of it?—M. W., Ames, Iowa.

The potentiometer is strictly a potential-measuring instrument. When used to measure current it does not do so directly, but measures the potential difference across a known standard resistance through which this unknown current is made to pass. From Ohm's law $E = I\,R$, therefore, if E has been determined and R is known, the value of the current I is readily calculated. In measuring current in this manner no part of the current I passes through the potentiometer when a balance has been obtained. The potentiometer is the most accurate instrument for measuring both potentials and currents; it is used extensively for calibrating voltmeters and ammeters.

AMONG THE CONTRACTORS AND SUPPLY MEN

To know what is going on among the men who do things and those who supply the material for the doing is always interesting. The actual happenings of the day with the contractors and the men who furnish them with supplies of all kinds, accurately reported from all parts of the country, is the object of this department.

THE ASHLAND ELECTRIC COMPANY, Ashland, Me., recently wired the house which is being built for J. R. Ketchum of that city.

THE BUCHANAN-BOUGHTON COMPANY, Marshalltown, Ia., will supply the electroliers which are to be used on Main street. C.

THE AMES PLUMBING AND LIGHTING COMPANY, Ames, Ia., was awarded the contract for furnishing the city with electroliers. C.

THE DECKER ELECTRIC COMPANY, San Francisco, Cal., has secured the contract at $46,000, for the construction of the electric-light system at the Presidio, San Francisco, Cal.

THE TWENTIETH CENTURY ELECTRIC COMPANY, Middleboro, Mass., recently wired the basement of Sullivan building of this city. The rooms are to be used for a bowling alley.

THE SOUTHERN ELECTRIC SUPPLY COMPANY, Waycross, Georgia, has the contract for electrical work in the building which is to be erected for the Union Banking Company in a short time. B.

THE SOUTHERN ELECTRIC SUPPLY COMPANY, Waycross, Ga., of which S. M. Byck is manager, received the contract for electric wiring and fixtures in the Y. M. C. A. building at Waycross. B.

THE DUBUQUE ELECTRICAL SUPPLY COMPANY, Dubuque, Ia., has been awarded the contract for wiring and other electrical work in the Hotel Julien at Dubuque. This is the third large contract which the company has secured within a short time.

WHITMAN & MOUNTFORD, 412 Cherry Street, Macon Ga., have the contract for installing electrical equipment for both power and lighting in the Alice Cotton Mills at Easley, S. C. J. E. Sirrine, of Greenville, S. C., is engineer. The company also received the contract for installing the electrical work in the postoffice at Griffin, Ga. B.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

AURORA, ELGIN AND CHICAGO.

The report of the Aurora, Elgin and Chicago Railroad Company for the month of June and twelve months ended June 30 compares as follows:

	1910	1909
June gross	$ 101,851	$ 142,568
Net	75,057	71,236
June surplus	40,590	42,254
Twelve months gross	1,596,777	1,458,998
Net	710,885	662,871
Twelve months gross	335,491	325,095

NORTHERN OHIO TRACTION.

The report of the Northern Ohio Traction and Light Company for the month of June and six months ended June 30, 1910, compares as follows:

	1910	1909
June gross	$ 221,673	$ 198,203
Expenses	123,125	107,976
June net	98,548	90,227
Charges	43,375	44,245
June surplus	55,173	45,982
Six months gross	1,087,335	973,942
Expenses	624,230	553,365
Six months net	463,105	420.577
Charges	259,917	263,320
Six months surplus	203,188	157,257

INTERBOROUGH RAPID TRANSIT.

Interborough Rapid Transit Company has issued a report for the year ended June 30, 1910, which compares as follows:

	1910	1909
Gross operating revenue	$28,987,648	$26,524,394
Operating expenses	11,013.143	10,747,443
Net operating revenue	17,974,505	15,776,951
Taxes	1,750,422	1,799,807
Operating income	16,224.083	13,977,144
Other income	411,024	1,001,775
Total income	16,635,107	14,978,919
Interest, rent, etc., including Manhattan Railway guarantee	10,552,960	10,389,096
Net corporate income	*6,082,147	4,589,823
Dividends	3,150,000	3,150,000
Surplus	2,932.147	1,439,823
Operating ratio	37.99%	40.52%
Passengers carried	562,788,395	514,680,342

*Equal to 17.37 per cent earned on $35,000,000 capital stock, as compared with 13.11 per cent earned on same stock last year.

DETROIT UNITED RAILWAY.

The report of the Detroit United Railway Company for the month of June and six months ended June 30 compares as follows:

	1910	1909
June gross	$ 831,472	$ 698,485
Expenses	512,996	423,826
June net	318,476	274,659
Other increases	12,436	12,171
Total increase	330,912	286,830
Charges and taxes	168,530	156,997
June surplus	162,382	129,833
Six months gross	4,344,067	3,639,058
Expenses	2,770,785	2,251,359
Six months net	1,573.282	1,387,699
Other increases	74,068	71,079
Total increase	1,647,350	1,458,778
Charges and taxes	973,057	926,334
Six months surplus	674,293	532,444

AMERICAN TELEPHONE AND TELEGRAPH. COMPANY EARNINGS.

The report of the American Telephone and Telegraph Company, which was issued July 30, shows an increase of $8,522,500, or 11.8 per cent, over the gross revenue for the corresponding period for last year. The expense of operation increased $1,784,078, or 7.4 per cent, and current maintenance increased 6.1 per cent. The amount set aside out of revenue to provide for reconstruction and renewals was $13,894,974. Of this sum, $2,969,743 was used for these purposes, while the balance, $10,925,231, remains as a reserve for future replacements.

The net earnings show an increase of $1,547,859, while interest charges remain substantially the same. The net profits available for dividends paid increased $619,838. Of the $18,720,448 net profits, $12,618,026 were paid out for dividends, leaving a surplus for six months of $6,102,422, an amount substantially equal to half of the dividends paid.

The figures for the six months compare as follows:

	Six months, 1910.	Increase.
Gross earnings	$80,634,614	$8,522,522
Expenses—		
Operation	25,999,464	1,784,078
Current maintenance	12,513,823	721,647
Depreciation	13,894,974	3,605,373
Taxes	3,949,572	863,565
Total expenses	$56,357,833	$6,974,663
Net earnings	24,276,781	1,547,859
Interest	5,556,333	*28,572
Net profits	$18,720,448	$1,576,431
Dividends paid	12,618,026	619,838
Surplus	$ 6,102,422	$ 856,593

*Decrease.

ELECTRICAL SECURITIES CORPORATION.

The Electrical Securities Corporation has issued a report for the eight months ended June 30, 1910, as follows:

Underlying and investment bond interest received and accrued		$190,976
Interest received and accrued on notes, bank deposits, etc.		23,118
Dividends on investment stocks received		35,079
Total income		$249,173
Collateral trust bond interest	$ 95,924	
Expense	33,608	129,532
Net profits from income		$ 19,641
Profit sales on securities	$ 31,952	
Less disc. and prem. on series bonds	2,107	29,845
Surplus		149,486
Previous surplus October 31, 1909		917,842
Total surplus		1,067,328
Pfd. stock dividends	25,000	
Com. stock dividends	120,000	
		145,000
Surplus June 30, 1910		922,328

ONTARIO POWER COMPANY.

The Ontario Power Company of Niagara Falls and The Ontario Transmission Company, Limited, report receipts and disbursements for the year ended June 30, 1910, compared as follows:

	1910	1909
Sale of power	$704,005	$453,409
Government rentals	49,839	36,340
Gross earnings	654,166	417,069
Expenses and taxes	131,477	*244,180
Net earnings	522,688	172,888
Other receipts	25,773	9,437
Net income	548,461	182,326
Interest, etc.	429,588	310,346
Balance	118,873	†128,020

*Includes flood damage, $134,657.60. †Deficit.

R. C. Board, secretary and treasurer of the company, says that the sale of power now averages about 61,500 horsepower per month, and estimates that by January 1, 1911, the sales will be upwards of 82,000 horsepower.

New Electrical and Mechanical Apparatus and Appliances.

New Interpole Railway Motor.

In further extending its line of railway motors, Allis-Chalmers Company has recently placed on the market its type 501. This is an interpole motor which has been developed to meet severe conditions of operation, especially on lines which use a potential of 600 volts or over. It also has desirable features for use where a lower voltage is employed.

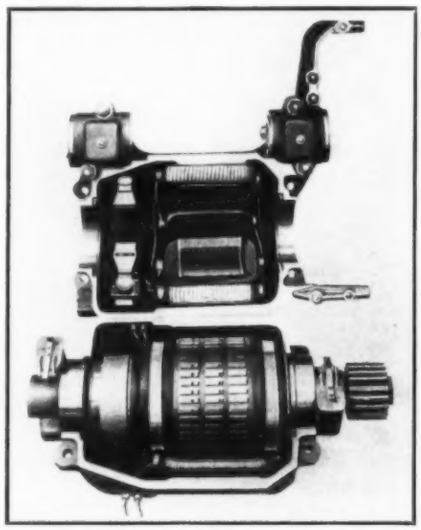
As is seen by the accompanying illustration, the motor is unusually sturdy and strong, with ample provision for wearing surface in the bearings. The arrangement of the interpoles can also be plainly seen. Special arrangements are made for ventilating the motor and therefore very cool running is secured.

The field frame is constructed of high quality cast steel and is split horizontally through armature and axle bearings, so that it may be opened downward. The commutator and brushes can be readily inspected by means of an opening of large size which can be covered when the motor is not being inspected.

The main pieces are of soft steel punchings, securely clamped between malleable iron end plates, to which they are riveted. The interpole or commutating pole pieces are of solid steel. The field coils are of the mummified type, thoroughly insulated and with the insulation impregnated with a moisture and water-proof compound. The coils are firm and have excellent heat-conducting properties, which assist in the cool running of the motor.

The bearings are bronze with a thin lining of babbitt and are carefully fitted to the bearings' housings. Ample lubrication is provided for the bearings and at the same time there is no chance for the oil to work into the commutator or windings. The armature journals are made amply large and the axle-bearing bushings correspond. The standard axle of the American Street and Interurban Railway Association can be used.

The gears are made of high-grade cast steel and are furnished either in the solid or split type. The pinions are made from high-grade hammered steel and are bored taper to fit the taper on the armature shaft. The gear case can be supplied either of sheet steel or malleable iron. The former is preferred, as it combines lightness with strength and the Allis-Chalmers Company has worked out a special construction which



MOTOR WITH FRAME OPENED.

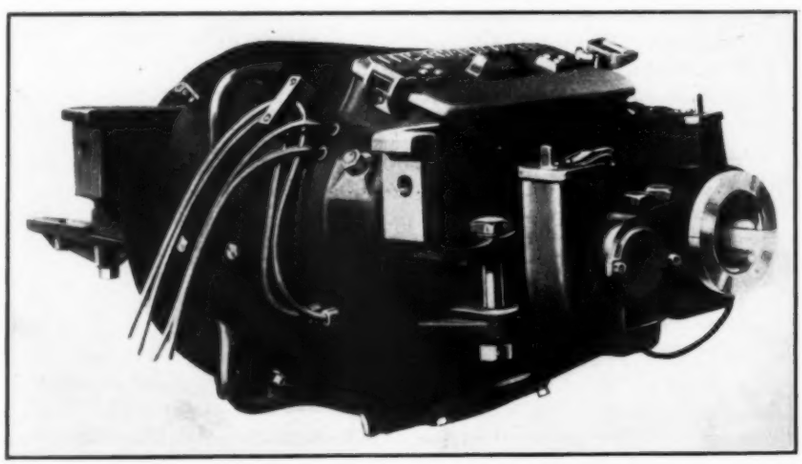
does away with difficulties formerly experienced.

The armature core is built up of soft steel laminations carefully annealed and varnished after punching. They are securely clamped between end heads, which also have rims to support the coil ends a uniform distance from the shaft. The laminations are built up on a cast spider and ventilation ducts are arranged. The spider also carries the commutator, so that shaft renewals can be made without disturbing the windings. The coils are wire wound and insulated in the usual way, but after being pressed in steam-heated molds, are cooled under pressure, which gives each the same dimensions. This makes the coils absolutely interchangeable, which greatly reduces the labor whenever it becomes necessary to rewind the armatures.

Hard-drawn copper commutator bars are mounted on a cast-steel sleeve. Mica insulation is used between the bars and a one-piece mica cone ring is employed. The commutator is very carefully constructed, with ample dimensions and with creepage surfaces extra long.

Two cast-brass brush holders are mounted in the top half field frame. They are each arranged for two carbon brushes held down by spring-pressed arms. The holder body is adjustable to care for commutator wear, and the brushes are kept in correct position. The brush end of the copper shunt or "pigtail" is so arranged that an exchange of brushes is easily effected.

This motor is rated at fifty horsepower on 600 volts or forty-two horsepower on 500 volts. These loads can be carried for one hour with a temperature rise not exceeding seventy-five degrees centigrade above the surrounding air. It has a continuous capacity of thirty-six amperes at 400 volts. The motors are designed for either double or four motor equipment, and standard gear ratios are employed.

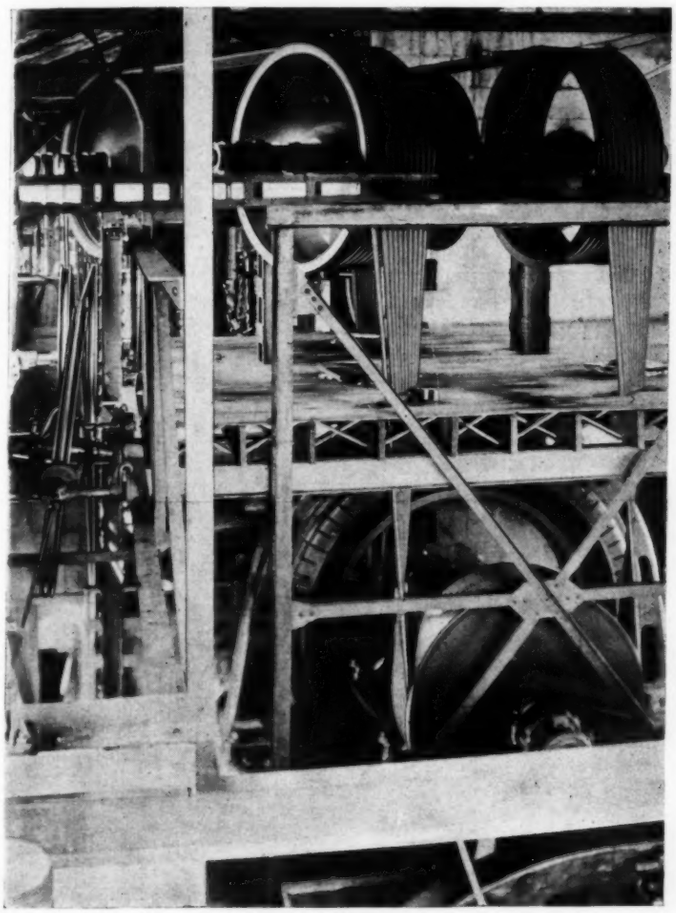


NEW TYPE—ALLIS-CHALMERS MOTOR.

Rope Drive Meets an Emergency.

The hydroelectric plant of the Economy Light and Power Company, Joliet, Ill., is a peculiarly interesting installation of the Dodge American system of rope transmission. The plant is located on the Illinois River, into which the Chicago Drainage Canal conducts the sewage of the city, diluted with water from Lake Michigan.

The company carries practically the entire lighting load of Joliet and vicinity, and drives the machinery in many of the large industries of that district. Constant growth of business having increased the total load beyond the limits of the water power available, the company has installed an auxiliary steam plant, using steam turbine generators.



ROPE DRIVE IN GENERATING STATION.

In the down-stream end of the long main building of the water-power plant is the equipment for generating direct-current. In an extension at this end of the plant was installed some years ago a 375-kilowatt alternating-current generator, driven by two 200-horsepower water-wheels. This unit was entirely independent of the equipment in the main building adjoining. The two waterwheels have a combined horsepower rating of 400, whereas the generator requires 500 horsepower to develop the full-rated capacity of 375 kilowatts. The water-wheels, therefore, are insufficient to drive the generator up to full load, to say nothing of carrying overloads.

In recent years the direct-current load has decreased and the alternating-current load has increased. Increase of the alternating-current load has made it desirable that this 375-kilowatt generator be operated up to capacity and be made to assume its share of overload when required. The decrease of direct-current load fortunately made available a surplus of power in the main plant. To utilize the surplus of power from the main line to assist the two water-wheels in driving the 375-kilowatt alternator, naturally suggested itself as a way out of the difficulty.

There appeared to be little in common between the main line and the generator line. They seem to be different in every possible way.

The Dodge Manufacturing Company solved the problem after the fashion shown plainly by the accompanying photograph. A rope drive on the Dodge American system was designed and installed to meet all the requirements, including, in addition to the differences just mentioned, the necessity for going over the generator to reach a place on the shaft where a driven sheave could be mounted. A driving sheave was fitted to the main line, extended into the generator room. From this driver the ropes lead upward, over suitably placed idlers, and thence down directly to the driven sheave on the generator shaft. The tension equipment is nicely accommodated on a horizontal track, conveniently placed along one side of the room.

The drive consists of ten wraps of rope. The driving and driven sheaves are 100 inches and 62 inches in diameter, to accommodate the difference in shaft speeds. The idlers overhead are so placed as to lead the ropes properly to accommodate the difference in alinement of the shafts. The lead of the ropes over these idlers also accommodates the different directions of motion for the two shafts.

Changes in the Holophane Organization.

A number of changes in the personnel of the Holophane Company were announced at the company's annual conference, which was held recently.

W. F. Minor is appointed assistant general manager; C. Walter Jones, formerly manager of the New York branch, succeeds Mr. Jones as manager in New York, while H. D. Howe takes charge of the fixture department, which will be located at Newark, O.

The 1910 Holophane conference was the most successful in the company's history, 102 persons being present. Of these, ten were wives of various members of the organization, and eighteen were invited guests, the latter including representatives of the National Electric Light Association, the National Electric Contractors' Association and the Electrical Supply Jobbers' Association.

The Lansden Electric Wagon.

The Lansden Company, of Newark, N. J., has long enjoyed the reputation for building delivery wagons and trucks, ranging in capacity from 350 pounds to three tons, which are unique in so far as simple construction, light weight, great mileage, low maintenance cost and elimination of trouble are concerned.

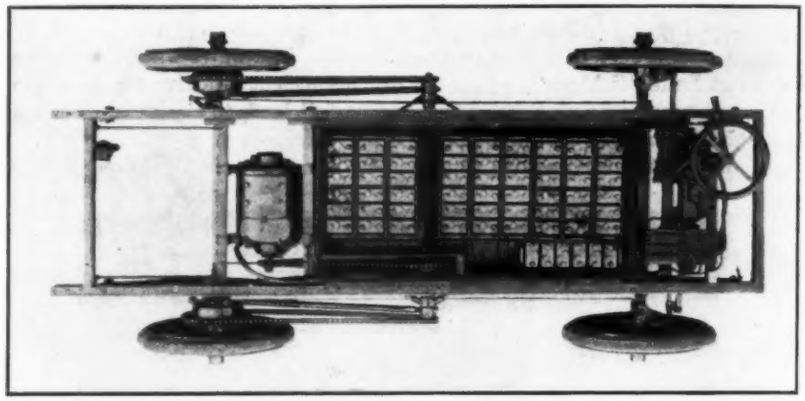
Simplicity of construction and operation is one of the main objects aimed at in the Lansden wagons—particularly the materials and parts are of the quality best suited to the purpose they serve. The annual cost for repairs and replacements has been surprisingly low. There is nothing about the vehicle that the ordinary driver or mechanic cannot understand easily and inexperienced drivers cannot damage them seriously through ignorant handling of the controller. It is claimed by the builder that in proportion to weight of vehicle and rated load capacity, the standard Lansden wagon body has the largest cubic load space of any electric delivery wagon or truck built. All Lansden wagons are driven by a single motor with single chain to a counter shaft and side chains to the driving wheels.

In all types of Lansden wagon or truck the frame is made of wood, preferably ash. This gives great resiliency, light weight, strength and flexibility. The battery weight is distributed over a considerable space and the battery box serves as a truss for the wagon frame.

In all cases the frame is steel armored, the steel lining of the same, being step-bolted to the frame. The rear springs are shackled at both ends allowing for inequalities in road surface and reducing jolting and vibration to a minimum. The motor is carried on angle iron sliding rails manipulated by distance rods which run to the rear of the wagon, allowing easy and absolute chain adjustment. The driving thrust is taken up by two distance rods equipped with right and left-hand threads, the distance rods acting radially about the countershaft boxes. The drive is direct from the motor sprocket by roller chain to the differential and the connection for the side chain on the outer end is made through a flat spring-steel shaft which also acts as a universal joint to take up inequalities of road surface.

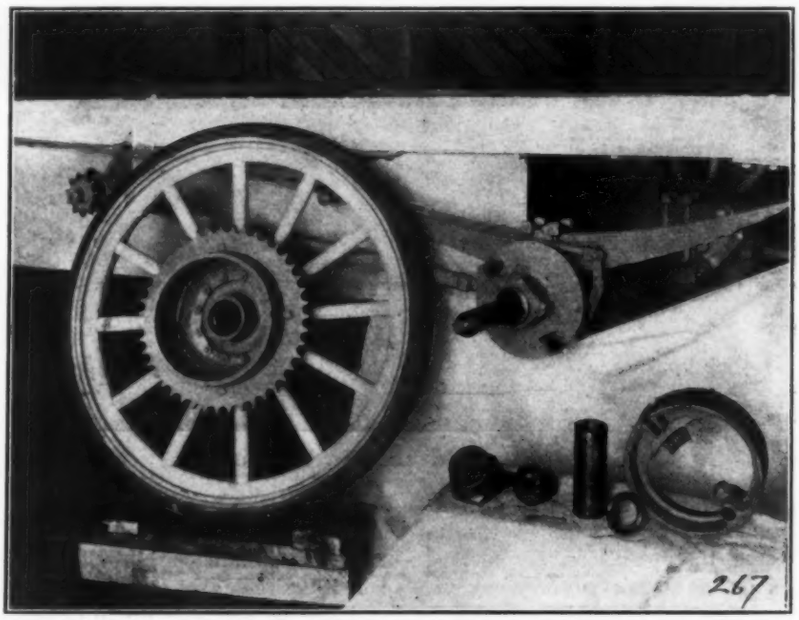
All of the control is on the front of the car, the controller being mounted entirely upon the chassis, nothing whatever being attached to the body of the car. The controller handle is mounted upon the post of the steering wheel and is interlocking between running, off and charging. A specially made key with a peculiar offset is provided, and this key can only be removed in the off or charging positions.

The steering gear is made up of steel gears with two-inch faces enclosed in a tight case and packed in grease. The brakes are of the internal expanding type with a factor of safety considerably beyond the maximum possible requirement.



VIEW OF CHASSIS, LANSDEN ELECTRIC VEHICLE, SHOWING ARRANGEMENT OF BATTERY.

The Lansden vehicles are equipped with a plain bearing of rather peculiar construction. Over the forged axle a bronze sleeve is slipped; between the inner end of the hub and the collar on the axle there is a thrust ring and a felt-washer. The sleeve is provided with a helical rifling in the bore and a sim-



WHEEL REMOVED FROM HUB SHOWING INTERNAL ARRANGEMENTS AND DETAILS.

the forward and reverse positions. The controller is entirely covered with a box and the mechanism is easily reached through a swing-bolt cover.

The controller is of original design and provides a continuous torque with three or four forward speeds, according to the capacity of the wagon, and two reverse speeds. This form of control gives steady acceleration in starting, free from breaks in the current. The main switch is operated by a foot pedal and there are three positions,—

ilar rifling on the outer surface. As these helices are opposite on the interior and outer surface, a sort of centrifugal action is set up by which the grease passes from one end along the under side of the bore and back across the outer surface of the sleeve. After the wheel is slipped on and adjusted, a covering nut holds the wheel and the internal arrangements in place. All of the driving parts are made either drop or hammer forged and are made to special design, no supply stock being used.

The Lansden vehicles are made with any type of body and with several types of running gear and frame. The Company makes the complete car, attending to every detail of design, construction and finish.

An interesting demonstration was made recently with the Lansden vehicle. A one-ton wagon with about 1,200 pounds' load being driven to Philadel-

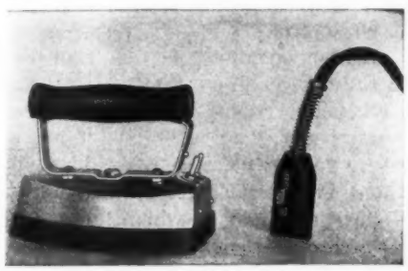


FIG. 1.—LEAF-UNIT FLAT IRON.

phia and return, one charging being necessary in each direction. The average speed was between twelve and fifteen miles per hour, the return trip being made in especially fast time, the party leaving Philadelphia at 11 a. m. and arriving at the battery in New York at 8 p. m. The distance traveled was approximately one hundred and twenty miles each way, and although two distinct routes were used in going and returning, encountering hilly country and bad roads, there were several miles still left in the battery upon return.

The Lansden wagons are equipped exclusively with Edison storage batteries. This new nickel-iron battery has been given especially satisfactory service in this connection. A description of the Edison battery appeared in the July 23 issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, where curves were given showing the performance of the battery at the start and after a large number of discharges.

New Heating Devices.

In the bustle of modern life, economy of time is of supreme importance. The housewife is no longer content to wait for the fire to be kindled. As a result

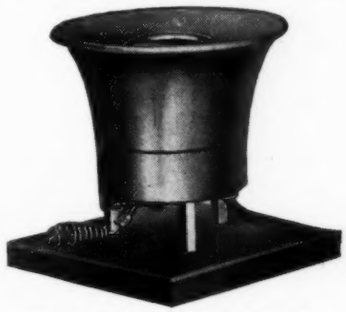


FIG. 2.—SEALING-WAX HEATER.

electric heating and cooking devices have established themselves as an indispensable part of the household equipment.

As the field for such devices is rapidly extending, a description of some of the latest devices manufactured by the General Electric Company will be of interest.

This company early realized that the success of heating devices would depend largely on the qualities of the resistance or heating element, and the supervision of its manufacture. The discovery of a new alloy which was named "Calorite" resulted after much experimenting and testing. This alloy has a high resistance, a high melting point and is non-oxidizing. It is ductile and malleable but is not in the least degree brittle. The design of the heating element is based on a careful consideration of thermal conductivity, convection and radiation, also of elec-

FIG. 4.—SOLDERING IRONS.

trical and thermal insulation, of resultant temperature, and of heat storage.

ELECTRIC FLATIRON.

The eight-pound leaf unit electric flatiron, shown in Fig. 1, is well suited for light, medium and heavy laundry purposes and, it is claimed, will give excellent satisfaction in both domestic and commercial work. It is provided with a leaf-heating unit which is spread over a broad path around the edges of the bottom surface so that the heat is delivered most directly to the parts of the iron which first come in contact with the damp material.

Rapid heating and ample heat storage have been combined in proper proportions to make a very efficient iron. Three standard forms of connection are provided, the plain attachment plug, the indicating switch plug, and the permanently attached cord. With light or medium work it is advantageous to control the heat regulation by turning the current on or off as required, depending upon the nature of the work. This may be most readily accomplished by means of the indicating switch attachment plug. For very wet or heavy goods, it is is generally

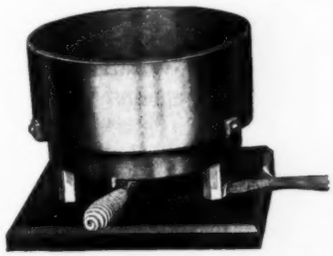


FIG. 3.—ELECTRIC SOLDERING POT.

necessary to keep the current on continuously.

These irons may be attached to any lighting circuit, either alternating current or direct current, where the pressure does not exceed 125 volts and consume 650 watts.

ELECTRIC SEALING WAX HEATER.

This device, shown in Fig. 2, is designed for use in express offices, banks, shipping departments, stores and business establishments of all kinds where sealing wax is used for making seals, sealing packages, etc. It is fitted with a removable sheet metal cover, the surface of which slopes downward to a center hole which provides access to the melted sealing wax. This feature of design also allows all drippings to drain back into the pot. This type of heater is most useful for continuous service where large quantities of sealing wax are required.

It has a maximum capacity of three pounds, and is arranged for three degrees of heat control, "Off," "Low," "Medium" and "High" points, con-

suming 65, 100, and 200 watts respectively. The maximum heat is used for quick heating and the minimum heat then maintains a constant operating temperature.

ELECTRIC CELLULOID HEATER.

During the last few years, the manufacture of celluloid articles has attained great importance, due to the extended use of this material for personal, domestic, ornamental, office and industrial purposes. Celluloid is used as a substitute for ivory, bone, hard rubber, coral, etc., having a close resemblance to these substances in hardness, elasticity, and finish. Since it is moulded while hot, the necessity of constant and exact temperatures is imperative in order to avoid accidents because of its inflammable nature.

These requirements are well fulfilled by the sixteen by thirty inch General Electric celluloid heater. By the use of this device the product is made uniform in quality as the same degree of heat is always produced and the work can be duplicated without variation. It is portable and can be easily installed wherever convenient. The heat is instantly available and readily controlled. It replaces high pressure steam with its attendant danger of explosions, leaky pipes, and transmission heat losses.

ELECTRIC SOLDERING POT.

A great advantage of this device is its elimination of the use of coal, gas, gasoline, oil and other dangerous and unhealthful heat producers. The heat is very easily regulated so as to maintain the molten metal at the proper temperature for best results.

It finds extensive application, being suitable for melting lead, solder, babbit metal, for tinning, dipping, and soldering wires and other small articles, for telephone manufacturing establishments, electrical repair shops, etc.

In construction it is a shallow circular vessel of cast iron, the cup being assembled on top of the heating disc. The heating unit is readily accessible. There are three degrees of heat regulation, consuming 200, 400 and 600 watts respectively.

OIL-TEMPERING BATH.

In the present age of large manufacturing plants equipped with high speed tools, the cutting steel must be uniform and reliable. This requires the use of hardening and tempering processes which produce reliable results.

The tempering process involves two steps, hardening and drawing. The first step consists in heating the steel to a temperature of from 600 degrees to 700 degrees Centigrade, depending on the amount of carbon in the steel, and then chilling it by plunging it into a cold bath. The temper of the tool is then "drawn" by heating it to a certain predetermined temperature, after which it is allowed to cool gradually. It has been customary for the workman to judge this temperature by the color assumed by the metal. This introduced the liability to error of judgment on the part of workmen. Realizing the shortcomings of this process, the General Electric Company have designed a device which eliminates this uncertainty and ensures absolute uniformity in tempering. The steel is suspended in an oil bath, which is provided with a thermometer of precision for registering the temperature. The workman is supplied with a table of temperatures corresponding to certain degrees of hardness in the steel.

ELECTRIC SOLDERING IRONS.

The advantages of electrically heated devices are well illustrated by this device. They are economical, convenient, and reliable, heat quickly, are easily regulated and maintain a constant and uniform temperature. All the heat is generated in the tip where it is available for work.

Universal Flat-Rate Controller.

Of interest to the electrical trade is the announcement that the Eclipse Electrical Manufacturing Company, Chicago, has secured the patent rights from the Universal Manufacturing Company to manufacture the Universal flat rate controller.

This controller, which is constructed along the most approved lines, will operate successfully on one eight-candlepower lamp, switching off the current automatically should additional lamps be added. The controller will act upon as low an overload as one-quarter of an ampere, switching the current on and off at short intervals until the overload is removed.

The Eclipse company's plant is located at 416-418 Milwaukee Avenue. The officers of the company are: President, F. C. Kirchhoff; vice-president, A. C. Kraft; secretary, Wm. C. Gohde, and treasurer, T. P. Evans.

Flaming Arc Lamps for Excavations.

One of the special purposes to which the flaming arc lamp is well suited is that of illuminating excavations. It does this work so well that it has been found that more and better work can be done in making excavations in cities at night when illuminated by flaming arcs than can be done in daylight. This is true because at night the workmen are relieved of all the annoyances and interruptions which go with daylight in the city, and because a flaming arc lamp gives a light as brilliant and as well distributed as sunlight.

The position of the arc in a flaming arc lamp gives a distribution of light as much downward as outward. When illuminating large areas the flaming arc lamp is usually suspended forty feet above the surface level, so as to get an even distribution of light at the surface. Should it be desired to illuminate an excavation, the lamp has only to be lowered.

Another advantage of this lamp lies in the quality of its light. This brilliant yellow light, which makes the flaming arc lamp unsuitable for use where delicate colors must be discriminated, is admirable for outdoor work. Yellow is a light to which the eye is most sensitive.

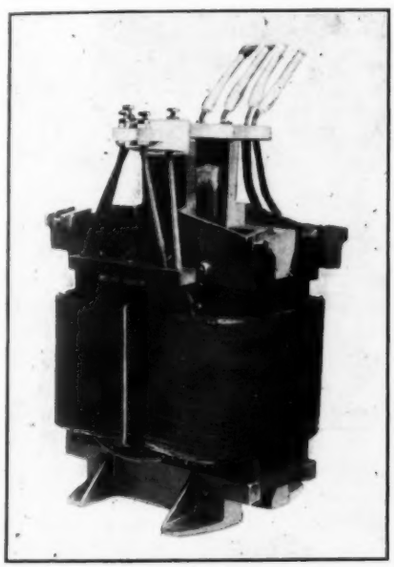
The efficiency of the flaming arc lamp is very high, and recent tests made on Hawthorn flaming arc lamps, manufactured by the Western Electric Company, have shown that this type of lamp will produce a light of 3,000 candlepower at the same cost as that of producing a light of 300 candlepower from an ordinary arc lamp. This means that where formerly five arc lamps were used, the same results may be had with this lamp at one-tenth the investment and at a decidedly lower cost for power.

A recent, interesting installation was that of several Hawthorn flaming arc lamps used for illuminating the excavation of the subway extension in Brooklyn, N. Y. Excellent results were reported.

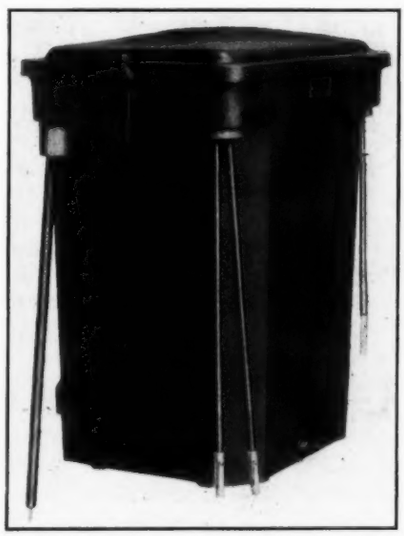
Twenty lamps of this make have been installed during the last few weeks to illuminate the tracks in the terminal yard excavation of the magnificent new Pennsylvania station, New York City, so as to facilitate the final work on the electrical equipment of the tracks.

Westinghouse Type SK Transformer.

The Westinghouse Electric and Manufacturing Company, Pittsburg, Pa., has recently brought out a new out-door distributing transformer, designated "Type SK," that was designed especially for 6,600 to 16,500 volts. The new SK transformer supersedes the former type OD, and undoubtedly will rapidly win a place in the transformer field corresponding to that held by the well-known type S, which has become so generally adopted for use in 2,200-volt service. The case of the type SK transformer, as well as its external appearance, is similar in a general way to that of the type S. The same general methods of construction are followed and all of the excellent features of the type S are embodied in the new transformer.



TRANSFORMER WITH COVER REMOVED.



WESTINGHOUSE TYPE SK TRANSFORMER.

Elbow-shaped bushings, which are made larger to take care of the higher voltages, hold the leads securely both inside and where they issue from the case. An insulating compound is poured into the bushing through a hole in the top to make an absolutely weather-proof joint. An impregnated gasket between the case and cover of the transformer prevents the "breathing" action that is often the cause of the absorbing of moisture into the case under certain conditions of service. Beside the oil plug at the bottom of the case there is a smaller water-drain plug, through which any slight accumulation of water can be drawn off without appreciably affecting the volume of oil in the case. The contour of the case is very symmetrical and the corners are well rounded; which feature and the impregnated gasket make for an excellent joint between the case and cover.

Both high and low tension terminal boards are kept under oil. This precludes the possibility of grounding the case. Special pains have been taken to prevent the syphoning of oil from the case. From where the low-tension leads come out of the case they are bared for several inches and soldered into one solid piece. The high tension leads from the terminal board are covered with treated cloth tubing, which extends into the high tension bushing. For a short distance in this bushing, the insulation is entirely removed from the cable, and the cable is soldered. Thus, the syphoning of oil from the case is effectively prevented on both the high and low tension leads.

The iron losses, copper losses, regulation, and exciting current will compare favorably with the guarantees made on the 2,200-volt type S transformer. Careful study has been given to the construction of the magnetic circuit, and the position of the gaps is such as to give a minimum exciting current. The number of gaps is reduced to only two; this has been accomplished by means of L plates.

Exhaustive study and calculation were followed by severe tests to prove the design before placing the transformer on the market. The tests of the electrical characteristics and the mechanical construction have shown the SK to be a great improvement over former types; its excellence is established. The reduced losses, greater insulation strength, reduced weight, smaller volume, and increased mechanical strength of the type SK transformer make it a very important step in distributing transformer development.

Emergency Electric Lights for Ships.

The steamship *Alabama* of the Goodrich line, which runs between Chicago and Muskegon, Mich., has recently installed an interesting system of emergency electric lights which is furnished with current from a storage battery.

These lights have been installed to provide illumination in the corridors and on stairways in case of an accident to the generating apparatus, or, in case of the sinking of the vessel, lights would be available to aid passengers in making their escape even after the hull of the boat had sunk some distance in the water.

In order to provide illumination as long as possible in case the boat should sink, the battery has been placed at the highest point of one of the upper decks.

The storage battery in use is composed of fifty-six cells type ET "Chloride Accumulator" in glass jars, manufactured by the Electric Storage Battery Company, having a rated output of 4.5 amperes for eight hours. This battery will supply current for ten hours on one charge for twenty-five four-candlepower 110-volt carbon lamps which are in use in this installation.

The battery is charged during the day, and at night, after the generators stop running, the lights used on decks, in halls and stairways are supplied with current from the battery alone. This system provides a reliable source of lighting which is always available in case of accident.

Record Sales for Wire.

Judging from the rate at which the American Steel and Wire Corporation is receiving orders, this company, says the Wall Street Journal, will do the largest business in its history during the current month.

The American Steel and Wire Company is a subsidiary of the United States Steel Corporation.

The Electric-Vehicle Situation in Ohio.

At the convention of the Ohio Electric Light Association recently held at Cedar Point, Ohio, one of the papers presented that elicited an especially spirited discussion was that by J. T. Kermode, of the Cleveland Illuminating Company, on the subject "What Progress is Being Made in the Introduction of Electric Vehicles in Ohio?" An abstract of this paper was given in these columns last week.

D. L. Gaskill said that he had found central-station men very enthusiastic as to the desirability of having that kind of a load, but he regretted that he had not found any very great pushing being done by the central-station men to induce customers to buy electric vehicles. He thought that was a mistake, and that the central-station men should be the ones that would push the hardest to get electrics introduced, because being largely off-peak load it is desirable business. He learned that several of the stations required that the vehicles must be charged either in the daytime, or after nine or nine-thirty at night, and offered a corresponding reduction in the current from lighting rates. He found the average price to be about five and a half cents per kilowatt-hour over the state; some stations charging as low as four cents and some at practically up to their lighting rate. At his city (Greenville) with a population of about 7,000, they have had experience with three such vehicles and have found them satisfactory customers for a town of that size. They averaged about $7 a month gross income.

Dr. Fitzgerald, of the Greenville plant, asked what the cost is per mile approximately under the $5.00 or $6.00 rate.

Mr. Kermode thought that the charging of pleasure vehicles would cost between six-tenths and seven-tenths of a cent per mile, based on the six and a half cent rate. Mr. Laganke stated that he had kept pretty close track of the cost of charging batteries for small Baker runabouts and found it to be three-fourths of a cent per mile under the five-cent rate.

Doctor Fitzgerald inquired whether at low temperature the electric motor can be run satisfactorily. Considerable trouble is experienced with gasoline motors in extremely cold weather.

Mr. Kermode replied that weather conditions do not make any difference on the efficiency of the motor. In cold weather the battery charge ought to be started at a high rate for about an hour or an hour and a half. The charge is then decreased to the normal charging rate. The efficiency of the battery is slightly lower in cold weather than it is in warm weather, but that of the motor is the same

Mr. Chappelle said that in connection with Mr. Kermode's paper one thing had struck him with considerable force, namely, that it has been pretty well demonstrated that the electric vehicle business is a very good thing for central stations, but in order to make it satisfactory also to the customers who use electric vehicles, he believed that central-station men should occupy a sort of advisory relationship toward such customers. He had found that in a great many cases parties would purchase an electric vehicle and rectifier, and have some electrical contractor set up the rectifier, the company would deliver the car, and everything would be apparently very lovely, and then in a couple of weeks the party who bought the apparatus would begin to complain that he was not getting quite as good results as he had expected, and an investigation would usually develop that he had not had proper instructions. Of course, the vehicle people send instructions with the vehicle and the battery, and certain instructions come with the rectifier or motor-generator set, but the purchaser does not seem to be given a concrete idea of the relationship of the several parts of the apparatus as a whole.

Mr. Anderson remarked that there is some trouble at times in co-operating with the vehicle men, and while the latter urge everybody to go into the business of selling vehicles, he considered that central stations can get better results in other directions than in the sale of such vehicles.

F. M. Tait, of Dayton, suggested that he did not believe the central stations of Ohio thoroughly appreciate the wonderful possibilities there are in the sale of off-peak current to electric truck users. Such current can be sold and delivered without the installation of a single additional piece of generating apparatus, and in view of that it is well worth effort to procure the business. It is a simple matter to prove that the electric vehicle truck is a better proposition in every way than the gasoline truck. The handling of the electric truck business simply simmers down to the proposition whether a man can effectively transact his business per ton mile cheaper and better by the electric truck than any other type of vehicle. The manufacturers of electric trucks are particularly desirous to co-operate with central stations to help sell these trucks, and if the central stations would go to prospective users and learn what their probable tonnage is and the number of stops they want to make, etc., they ought to be able to prove to the prospect that the electric truck is the cheapest and best thing they can use taking all things into consideration. The average electric truck will produce from $200 to $500 a year business for the central station under the average rate. Central stations heretofore have looked upon the electric truck as a useless toy, but it has emerged from this stage until today it may be considered a very valuable and dependable piece of apparatus. In presenting the claims of these trucks to the public in their true light one cannot expect to induce a man to purchase one simply because one says it is a good thing, but one has to get down to business and prove it to him by facts and figures.

Mr. Griffin referred to the remarkable record of Robert Searle, of Rochester, N. Y., in inaugurating a scheme of furnishing electric trucks to consumers at regular list prices, and then furnishing them free current and maintenance for one year. Of course, the profit on the truck does not entirely pay for the one year's current and maintenance, but the difference was counted in as part of the cost of getting the business.

The Indiana Railroad Commission Issues Annual Report.

The Indiana Railroad Commission has issued its fourth annual report in which it advocates the passage of a law requiring the separation of all grade crossings of steam and interurban roads and ultimately all grade crossings between railroads and public highways. The commission also advocates the adoption of 1,500-candlepower electric head lights on locomotives. There are a score or more suits now pending in the courts asking for permanent injunctions to restrain the commission from forcing the railroads to install electric headlights on locomotives. S.

Current Electrical News

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, July 26.—The Swiss federal railroad administration is taking measures toward building the second tunnel for the Simplon line. At the start there was only one single-track tunnel constructed, but provision was made at that time for building a second tunnel alongside the first one. The time has now come to carry this out, but matters will probably be much delayed, seeing that the contracting firm, which was engaged to build the second tunnel for about $4,000,000, now refuses to do so.

Electrical applications are to be represented at the coming congress of the French Association for Scientific Advancement. It will be held at Tolouse from August 1 to 7, and an exposition of different kinds of electrical apparatus will be one of the features.

Among the recent electrical projects in France, I note that the town of Tournus is taking measures to install a combined electric and gas-lighting system. Electric-lighting projects are being considered by the towns of Nessarges and Domme. Electric motors will be extensively used at the port of La Pallice for carrying out different operations, and there will be installed motor-driven capstans, cable drums, pumps, air compressors, etc. In the region of Calais, the Northern Company, which operates various local traction lines, has applied for the rights to change over about forty miles of steam railroad to electric traction.

In Bavaria, electric traction is to be applied extensively on the railroads, according to a recent decision. The single-phase system will be adopted for this purpose. Three lines are to be changed over during the first period, these being the Salzburg, Berchtetsgaden section and the lines running from Garnisch to Griesen and Scharnitz. About $2,000,000 will be applied for this work.

The Italian Electro-Chemical Company is to carry out a project for a turbine plant on the Pescava stream, which will be one of the largest to be devoted to electrochemical uses in the country. The station will be situated at Torre de Passari and part of the current will be sent to Naples, a distance of 120 miles, over a power line. It is stated that the line will work as high as 90,000 volts.

At a recent meeting of the Energie Electrique Company of France, which controls an extensive network of plants and power lines in the southern coast region, it was proposed to absorb the Durance Hydraulic Power Company and also to increase the capital stock.

The first electric railroad line in France to use direct current at 2,400 volts is to be built from La Mure to Gap, in the Alpine region, and it will be about fifty miles in length. The concession for the electric output has been awarded to the French Thomson-Houston firm.

The new subway station on the Paris Metropolitan line at Place St. Michel has recently been opened to the public, although the work is not entirely finished. It differs much from the others from the fact that it is built of caissons, which were sunk from the surface to a point below the level of the Seine, as it lies on the river bank. Passengers descend by a winding iron staircase, and there is also an electric elevator in construction, which will be the first one of the kind to be used on the subway.

In the Alpine regions of France there is a large plant erected for the manufacture of nitrogenous products according to the Pauling method. It is located at La Roche, on the Biayse stream, and at present there is a turbine station of considerable size built in order to secure the current for the works, using four turbine units of 2,000 horsepower.

A new submarine telephone cable of a type which differs much from the other ones has been laid between England and France. It runs from Dover to Gris Nez Cape. Experiments made with the new cable are quite favorable, and it shows many points of superiority over the former ones, so that the French government expects to lay another one of the same type across the channel. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, ONT., Aug. 6.—The Railway and Power Company, of Sherbrooke, Que., is making rapid progress with the construction of its new modern power development. For some time past gangs have been working night and day on the new power plant.

The by-law recently passed by the city council of St. Catherines, Ont., granting a franchise to the Ontario Power Company to erect poles in the streets and distribute and sell electric energy throughout the city, will not come into force for some time yet. It is believed that the Cataract Power Company is behind the opposition to the by-law.

The one great remaining obstacle to the development of the Porcupine gold area, in Northern Ontario, is the question of obtaining power at a reasonable cost. This is being solved, as was the case in the Cobalt silver district, by the installation of electric plants at the great water powers which abound in the district. A lease of the water power at Sandy Falls, in Mount Joly township, has been obtained and it is proposed to develop between 4,000 and 5,000 horsepower at this plant by June, 1911. A. E. Walberg of the Mines Power Company, of Cobalt, has secured a very large water power on the Metagami River, about nine miles from Porcupine, and will be furnishing electric power by June of next year.

The annual meeting of the Mexican Light and Power Company was held at Toronto this week, when the annual report and accounts for the year 1909 were presented and approved of. The board of directors was re-elected, with the addition of H. Malcolm Hubbard, of London, England. The managing director explained to the meeting that the storage capacity of the company had been extended and that, at the present time, the company had over 20,000,000 cubic meters of water in storage. Dr. F. S. Pearson, of New York, was re-elected president of the company.

At the annual meeting of the Mexico Tramways Company, held at Toronto August 5, the board of directors was re-elected, with the addition of Lic Pablo Macedo, of Mexico City, and Viscomte Gaston de Breteuil, of Paris, France. The report of the managing director showed that Mexico had recovered from the late depression to a very large extent, and business was showing a decided improvement, which was indicated in the receipts of the company. These show a satisfactory increase. In July, a new line to Lake Xochimilco, a beautiful suburb, and one most popular with the Mexican people, was opened, and is yielding most satisfactory returns. At a meeting of the board of directors, Dr. F. S. Pearson, of New York, was re-elected president of the company. W.

IMPORTANT DEVELOPMENTS.

(Special Correspondence.)

IMPROVEMENTS AT NEW MILFORD, CONN.—The New Milford Power Company, a subsidiary of the New York, New Haven & Hartford Railroad Company, is making changes at its plant involving the expenditure of a quarter of a million dollars. The chief improvement will be the construction of a large reservoir with a surface measurement of nearly eight acres, at a point where the flume drops 100 feet down the hillside to the power plant. A core dam, 700 feet long and at places thirty feet deep, will hold back the water. This reservoir will not only permit storage of water when a part of the plant is idle, but will also do away with the necessity of drawing water through the canal at a rate rapid enough to cause erosion of the canal banks.

SOUTHERN PACIFIC ELECTRIFICATION.—The work of converting the local steam roads of the Southern Pacific Company at Alameda, Cal., into a modern electric-traction system is nearing completion. Practically all the track laying has been finished and nearly all the grading is done. Crossarm trolley poles have been installed and the large feed cables placed in position. The auxiliary electric powerplant on the north side of the tidal canal near Fruitvale Avenue bridge is approaching completion and the steel framework of the car-house at Alameda Point is in position. On the Alameda mole the trolley wires and the power cable will be carried on trusses extending between heavy iron poles. The trusses are already in position. Near the depot at the pier where a number of switches are to be used, the trolley lines will be attached to wires suspended from tall wooden poles. No definite date has yet been fixed by the Southern Pacific management for the new electric system to be put into operation.

LIGHTING AND POWER.

(Special Correspondence.)

DURANT, OKLA.—This city will soon put in an electric-light plant. P.

DEVINE, TEX.—Burnett & Fenneman are about to install an electric-light plant here.

CLEBURNE, TEX.—The Cleburne Electric and Gas Company will establish a power plant here. P.

CALMER, IA.—C. Miller & Sons, of Clermont, have been granted an electric-light franchise. P.

WINNER, S. D.—William Mullen, of Carter, is considering the installation of an electric-light system. C.

KIOWA, OKLA.—This city has voted additional bonds for the construction of an electric light plant.

FORT SCOTT, KAN.—The Fort Scott Gas and Electric Company will spend $75,000 on improvements. P.

PRAIRIE DU SAC, WIS.—Construction has been started on an electric-power dam on the Wisconsin River. C.

CARTHAGE, MO.—The Empire District Electric Company of Joplin will establish a substation in this city. P.

BROWNSVILLE, TEX.—This city is about to vote $15,000 in bonds for improvements to electric light plant. P.

EAST GRAND FORKS, MINN.—The council is considering the installation of an ornamental system of lighting. C.

FAIRMONT, MINN.—This city proposes to vote $30,000 in bonds for an electric-light and water-works plant. P.

TAYLOR'S FALLS, MINN.—The Minneapolis General Electric Company is constructing a new line to Minneapolis. C.

LA PRYOR, TEX.—The La Pryor Water and Light Company has been incorporated with a capital stock of $8,000.

ANTLERS, OKLA.—The Antlers Light and Power Company has been incorporated with a capital stock of $10,000. P.

ENERGY, N. D.—The North Dakota Heat and Power Company of Fargo, N. D., will put in a power and electric plant. C.

KANSAS CITY, MO.—The Big Niangua Hydro Electric Company has been incorporated with a capital of $150,000. P.

LAKEFIELD, MINN.—It is proposed to change the electric-light plant to a modern one, and install a gas producer engine. C.

NEW HOLSTEIN, WIS.—A vote will be taken on issuing bonds for $8,000 for equipping a municipal electric-lighting plant. C.

MORRILTON, ARK.—The Morrilton Light and Power Company has been incorporated with a capital stock of $20,000. P.

LEWIS, IA.—The Lewis Electric Light and Power Company, capital $5,000, W. B. Davis secretary, has been incorporated. C.

SAFFORD, ARIZ.—The Pacific Gas and Electric Company of Los Angeles, Cal., may install an electric light and power plant here. P.

CORYDON, IND.—The Corydon Light Company is advertising for a second-hand 100-kilowatt, direct-connected unit, in good order. S.

MINOT, N. D.—The county board is installing an electric-light plant in the courthouse and has purchased a Fairbanks gasoline engine. C.

CAMBRIA, WYO.—O. H. Jenks, of Tepee, Wyo., is planning the construction of a telephone line to the Black Hills in South Dakota. C.

WATERTOWN, S. D.—Work has been commenced on the erection of a five or six-story modern building for the electric light and power plant. C.

WEST LIBERTY, IA.—A 200-horsepower Corliss engine, a large, deep well pump, new smokestack and other improvements are being installed at the city power plant. C.

STREATOR, ILL.—The W. H. Schott Company, Chicago, has asked the city council for a franchise to build and operate a $75,000 central station, steam heat and power plant here.

LIVINGSTON, ALA.—The Livingston Light and Improvement Company has been incorporated with $5,000 capital stock by J. A. McConnell, P. B. Jamison, J. O. Phillips and others.

DOVER, N. H.—The Franklin Needle Works is installing a new electric power plant. Two turbines of sixty and thirty horsepower will be placed in the concrete power house.

ANACORTES, WASH.—The Anacortes Water and Electric Company has installed a 400-kilowatt Curtis steam turbine. The cost, including other additions to the plant, was about $16,000. C.

AKRON, O.—A power house to cost upwards of $2,000,000 will shortly be erected in Akron by the Great Northern Ohio Traction and Light Company, of Akron, O. Plans are now being prepared.

SMYRNA, GA.—This city will soon be lighted by electricity. The council has closed a contract with the Atlanta Northern Railroad and the lighting system will be in operation within a short time.

ALLIANCE, NEB.—It has been decided, at a special meeting of the city council, to buy the electric-light plant from its present owners. The city has made a formal offer of $14,000 for the plant.

ST. PAUL, MINN.—The Consumers' Power Company, of Stillwater, has secured control of the South St. Paul Electric Light, Heat and Power Company and will install improvements and extensions. C.

BASIN, WYO.—The city has purchased the plant of the Wyoming Electric Light and Power Company for the sum of $18,000. This is the first municipally owned lighting plant in Wyoming.

MACON, GA.—The Cherokee Brick Company, of which S. T. Coleman is proprietor, has signed a contract with the Central Georgia Power Company, of Macon, for electrical power for operation of its entire plant.

VANDALIA, ILL.—The proposition to issue public improvements bonds to improve and repair the electric light plant and to extend the waterworks was carried at a recent election. Bonds were voted for $10,000.

FARGO, N. D.—The Union Light, Heat and Power Company will improve its plant by the erection of a brick building, thirty by thirty feet, and the installation of a new engine and generator. The improvements will cost $10,000. C.

SAN FRANCISCO, CAL.—The Pacific Gas and Electric Company of California has purchased the power plant and water supply stations situated at Wheatland, Lincoln, Davis, Roseville, Cordelia, Elmira, Winters, Dixon and Benecia, Cal. A.

TOLEDO, O.—A powerhouse is to be erected in this city at the corner of West Woodruff Avenue and Wakeman Street, by Macomber Brothers Company. The building is to be constructed on the unit plan so that additions may easily be made.

THUMONT, MD.—The electric power plant which was put in operation on July 4 was recently accepted by the city. This plant was established at an expenditure of about $20,000. Two generators which supply the current are driven by waterpower.

MIDDLETOWN, IND.—At the special election held here to vote on the proposition to install a municipal electric-light plant resulted in a good majority in favor of the installation of the plant. The estimated cost of the proposed plant is about $30,000. S.

RUTHERFORDTON, N. C.—The town has just voted in favor of a $35,000 bond issue for the purpose of installing complete water and electric-lighting systems for Rutherfordton. The bonds will be engraved and offered for sale without delay, it is reportetd. L.

SOUTH NORWALK, CONN.—The South Norwalk Electric Company is making an addition to its plant. The new engine, which has been ordered, will be furnished by the Diesel Engine Company. The extension to the plant will be in operation in a few months.

FAIRMONT, W. VA.—Growing demands for electric power have necessitated an enlargement of the Jayenne power plant of the Fairmont & Clarksburg Traction Company. The building which is being erected will contain two one-thousand kilowatt generators.

ANTIOCH, CAL.—The Contra Costa Electric Light and Power Company, which was established in 1898, has been absorbed by the Pacific Gas and Electric Company of San Francisco. It is understood that there will, for the present, be no change in rates.

HAMPTON, GA.—The Hampton Cotton Mills have awarded the contract to the Central Georgia Power Company, of Macon, Ga., for electric power for the operation of its plant. The company will discard steam power, substituting electricity for the 10,000 spindle mill. B.

HUNTINGBURG, IND.—The Huntingburg Electric Light Company has been incorporated with a capital stock of $25,000. The company proposes to build, equip and operate an electric light plant in Huntingburg. F. G. Katerhenry, August and Charles Miessner are directors.

ROCK ISLAND, ILL.—Work has been commenced on the plant of the People's Power Company. The station is to contain a steam-turbine generator of 12,000 howsepower. This turbine is to be supplied with steam from four watertube boilers, each of 600-horsepower capacity.

TEXAS CITY, TEX.—The Texas City Transportation Company which is installing an electric light system in this place has begun the work of erecting the poles for the wires. It is stated that the lights will be ready to be turned on in all parts of the town within three months. D.

GREAT FALLS, MONT.—The new Rainbow Falls power plant was put in operation a short time ago and is now supplying current to the street-car system in Butte. The plant was erected at a cost of approximately $1,000,000, and when in full operation will generate 42,000 horsepower.

FORT BAYARD, N. M.—J. B. Downey of Silver City, N. M., has been awarded the contract by the federal government for the installation of the electric light plant and wiring the new officers' quarters and ward buildings at Fort Bayard. The cost of the improvements will be about $130,000. D.

MILES CITY, MONT.—A fire-alarm system will be installed at the fire hall. An ordinance has also been passed authorizing bonds for the improvement of the electric-light system, including a 250-horsepower Corliss engine, a 200-kilowatt generator, two fifteen-kilowatt exciters and a fifty-horsepower motor. C.

MIDDLETOWN, IND.—This city has decided to install a municipal lighting plant to be operated in conjunction with the water plant. The town board is authorized to give bonds amounting to $10,000, which will about cover the cost of the plant. Seventy 100-watt tungsten lamps will be installed for street lighting.

GREGORY, S. D.—The new electric light plant is completed and the current has been turned on. In addition to furnishing lights for streets, business houses and residences, the plant is capable of furnishing power for the mill and other enterprises requiring a motor.

DEVINE, TEXAS.—An Indianapolis, Ind., concern, represented by Messrs. Burnett and Fennenman of that city, have made a proposition to install an electric-light plant and ice factory here. The town will furnish a free site for the proposed plants. It is stated that the electric light plant will be placed in operation in ninety days. D.

EAST ST. LOUIS, ILL.—The Citizens' Electric Light and Power Company, the East St. Louis Light and Power Company and the Southwestern Light and Power Company all located in this city have certified to the secretary of state at Springfield to a consolidation under the name of the East St. Louis Light and Power Company. Z.

BALTIMORE, MD.—The mayor is at present considering the installation of a lighting plant in the old police station on Guilford Avenue. This plant is to supply current for lighting the City Hall, the courthouse, the two City Hall annexes and other municipal buildings. At the present time the lighting plant is in the basement of the courthouse.

ROCKVILLE, IND.—The town council is in the market for new street lamps, having decided to change from a direct to an alternating-current system. This will do away with one dynamo, and will greatly improve the system. The change involves an outlay of $1,500. Rockville owns its own electric-light and water-works plants, the two being operated together. S.

WICHITA, KAN.—A new power plant with a capacity of 10,000 kilowatts is to be built soon. Plans were prepared by Sargent & Lundy, of Chicago, and they will superintend the erection of the plant. In addition to the new plant improvements, changes are to be made in the wiring of the city. Ornamental iron posts will be used and the lines are to be run in underground conduits.

PHILADELPHIA, PA.—The Pomeroy Construction Company has been awarded the contract for the erection of a powerhouse for the Stephen Girard estate at a cost of $20,000. The structure will be one story high, of brick and reinforced concrete. The plans were prepared by John T. Windrim. This is the second powerhouse of its kind that has been built by the Girard estate in the southern section of the city.

FORT WAYNE, IND.—The Wood Magnetite lamps, invented and perfected by J. J. Wood, of the Fort Wayne Electric Works, have been given a thorough test on the lighting lines of this city. The result is highly satisfactory. The new lamps cast a brilliant light with less expenditure of current and at less cost of maintenance than the old arc lamp or other types of magnetite lamps. The lamps are strung in the places of the regular arc lamps in various parts of the city. S.

ROCK HILL, S. C.—The board of public works, appointed by the town council to investigate the feasibility of building or acquiring an electric-lighting and water plant, has reported to the council that the owners of the present lighting and water systems, headed by Martin Maloney, of Philadelphia, are open to a proposition. The company has suggested that the price to be paid for their holdings by the city be determined by three men, one to represent the city, one the company, and these two to select a third man. L.

BROWNSVILLE, TEX.—The city council of Brownsville has let the contract for the installation of additional machinery in the electric light and water plant to the amount of $18,500. The new machinery consists of generators, pumps, and engine, and will increase the plant twice its present capacity. The Westinghouse Electric & Manufacturing Company received the contract for the electrical machinery and the Harrisburg Foundry and Machine Works will furnish the machinery for the water works. D.

MARION, IND.—A proposal has been made to the city council by the Marion Light and Heat Company, operating the only commercial lighting and electric power plant in this city, to light the streets for $57.50 per arc light per year, and to decrease the price to private consumers from ten to eight cents per kilowatt-hour. The cost to the city to maintain a plant for street lighting is claimed to be $75 a year for each light. The offer of the Marion Light Company follows a long controversy over the proposal of the city to enter the commercial lighting field. S.

BEDFORD CITY, VA.—The contracts for the construction work for the hydro-electric power plant for Bedford City were awarded recently, as follows: Concrete work, power house and race, to James R. Guy, Jr., of Bedford City, $13,680; repairs to dam, to L. A. Sadler, from whom the dam was purchased, for $2,000; all electric appliances to Westinghouse Company, Pittsburg, $19,898; electric line complete to S. L. Livers, of the Grottoes, for $17,800; turbine wheel and all machinery connected with the water power to S. Morgan Smith, for $11,481. F. Weller, of Washington, has the contract as engineer of construction in all departments.

BEDFORD, IND.—The Bedford Power Company is planning a very extensive hydroelectric development on the east branch of the White River at Williams, Ind. Recently it purchased two 750-kilowatt steam-turbo-generators from Allis Chalmers Company to start its power delivery. After the completion of the hydroelectric plant these turbines will serve as auxiliaries for emergency use. Allis-Chalmers Company has recently received an order for the first of the hydraulic and electrical apparatus for the new plant. This will consist of two 1,050-boiler-horsepower triplex vertical turbines operating under a head of seventeen feet. These will be direct connected to 1,000-kilovolt-ampere, 2,300-volt, sixty-cycle, three-phase alternators. Besides the two units which will be installed immediately, the plans are being made for three larger units to be put in service later.

ELECTRIC RAILWAYS.

(Special Correspondence.)

ADA, OKLA.—The McKenna Interurban Company has been organized with a capital stock of $500,000. P.

GENEVA, N. Y.—Surveys are being made for the trolley road from this city to Port Gibson, and construction work will commence as soon as possible.

PLYMOUTH, IND.—The South Bend and Logansport Traction Company has completed its line between this city and South Bend and will put it in operation in a short time. S.

COLUMBUS, O.—An interurban railroad line has been projected between Seymour and North Vernon, a distance of about fourteen miles. N. B. Brandenburg, of this city, is interested in the proposition.

FOND DU LAC, WIS.—The Eastern Wisconsin Railway and Light Company is taking steps toward the removal of all overhead wires, with the exception of the trolley wires, in the downtown district.

SALT LAKE CITY, UTAH.—The Utah Light and Railway Company is investing $25,000 in the establishment of a transformer and generator plant for the operation of the southern extension of its lines.

ALBANY, GA.—C. W. Rawson and other Albany citizens are interested in the movement to establish a street railway here. Plans are assuming definite shape, and it is stated that construction will probably begin on or before January 1, 1911.

STERLING, ILL.—The Sterling and Moline Traction Company has been organized to build an interurban line from Sterling to Moline, with a branch to Prophetstown and Morrison. The total distance is seventy-five miles. The company is capitalized at half a million.

OREGON CITY, ORE.—It is reported that Clarence Fields intends to construct an electric railway from Oregon City through the Molalla Valley. The line, if constructed, will cover the same territory surveyed by F. M. Swift, who has for the last three years been promoting the Clackamas Southern Railway.

FORT WAYNE, IND.—Engineers report that it will cost $1,054,290.97 to construct and equip the interurban road between Fort Wayne and Warsaw, which is being promoted by J. A. Barry & Son. Mr. Barry has gone east to secure the money to build the road and states that he is meeting with great encouragement. S.

GARY, IND.—The South Shore Traction Company is planning to build a branch line on Fifteenth Avenue from Gary to Clark's road, where the proposed White City is to be built next year. From this point the line will be extended to Hammond, entering the city from the south. S.

MUSCATINE, IA.—The General Construction Company, of Davenport, will shortly commence the construction of the road to Burlington, for the Muscatine North and South road. The Citizens' Railway and Light Company has been ordered to rebuild its track within the limits of the brick paving. C.

KEOKUK, IA.—It is reported here that the Dally Park, St. Louis & Eastern Railway, which was granted a charter at Springfield, Ill., will commence work soon and that they propose to build lines in half of the counties in southern Illinois. It will start from East St. Louis and run to the Indiana line in Iroquois County.

TEMPLE, TEX.—The property of the Belton & Temple Traction Company, recently purchased at receiver's sale by a syndicate of Pennsylvania men, is to be placed in first-class physical condition and the line extended to Waco. A system of electric railways will also be built by the new owners in Temple and Belton, the two terminal points.

INDIANAPOLIS, IND.—The board of public works has petitioned the city council to compel the Tractional Terminal Company to enter at once upon the construction of several crosstown lines. The franchise provides for crosstown lines at the will of the council. The company is willing to build and operate the crosstown lines, but the trouble is that the people object to lines being built on their streets. S.

JACKSONVILLE, FLA.—The Jacksonville Electric Company has ordered through the Stone & Webster Engineering Corporation ten semi-steel cars. The order has been placed with the Cincinnati Car Company and the equipment is as follows: Maximum traction trucks of the Standard Motor Truck Company, General Electric two-motor, 219 equipments with K-36 controllers, and General Electric air brakes.

TOLEDO, OHIO.—The Cleveland & Indianapolis Traction Company has been formed to connect the above-named cities by trolley next summer. Existing lines east of Norwalk and west of Bluffton will be used, the new road filling in the gap between being 147 miles long. It will pass through Tiffin, Findlay, Ottawa, Van Wert and Decatur. The line is being promoted by Banker Matthews of Ottawa, Ohio, and, it is said, is backed by London capitalists. H.

BURLINGTON, N. C.—The Burgrahan Traction Company, of this city, has been placed in the hands of Charles A. Scott, a banker, of Graham, N. C., as receiver, by order of Judge J. Crawford Biggs, of the State Circuit Court. The petition for a receiver was filed

by holders of the company's bonds, the Interstate Construction Company, Richmond, Va., and the North State Realty Company, of Burlington. It is said that the receivership is the outcome of suits brought. L.

MONTROSE, COLO.—Plans are under way for the building of an electric railroad between Montrose and Delta, twenty-nine miles. It is proposed to run the new line on the west side of the Uncomphagre River, along Spring creek and California mesa and through Shavano and Coal creek valley. The chief object is to bring farm produce from outlying ranches directly into the market without reloading.

CENTRALIA, WASH.—It is reported that C. Lewis and W. H. Allen of Chehalis have secured practically all the right-of-way for an electric line from Chehalis to Randle, which is to be part of an electric systetm extending from eastern Lewis County through Chehalis and Centralia to Grays Harbor. The Chehalis men are backed by New York capitalists, who are said to have $3,000,000 to put into the enterprise. The proposed route goes through Forest, Ethel, Salkum, Silver Creek, Mossyrock, Riffe and on to Randle.

PALESTINE, TEX.—It is stated by William Nathan of Dallas, who is associated with J. V. Watkins of Corsicana in the proposition to build an interurban electric line between Palestine, Corsicana and Dallas, that this enterprise is beginning to take definite shape and the road will be built within a short time. He states that a greater part of the right-of-way has been secured and that the people along the proposed line are taking much interest in securing the road. A rich agricultural district lies along the route of the line. D.

MILWAUKEE, WIS.—A new electric railway line between Milwaukee and Appleton is assured by the granting of the railway commission of an absolute and unconditional certificate of convenience and necessity to the Milwaukee & Fox River Valley Electric Railway Company. The proposed right-of-way lies along the east side of the Milwaukee River to the village of Hamilton, where it will cross the river to Cedarburg. Thence the route will lie through Newburg, Plymouth, Chilton, Stockbridge, Appleton, Menasha, Kaukauna and Fond du Lac.

EVANSVILLE, IND.—A syndicate of Indiana capitalists who are interested in the Evansville Railways Company has purchased the trolley line connecting Owensboro and Henderson, Ky., and also the local lines in both cities. W. A. Carson, formerly with the Indianapolis & Cincinnati traction line, now general manager of the Evansville lines, becomes general manager of the two Kentucky properties. The new owners will extend the Owensboro line to the Catholic cemetery, and pay-as-you-enter cars will be put in operation on the Henderson and Owensboro local lines at once. S.

TOLEDO, OHIO.—The Bluffton, Geneva & Celina Traction Company is the name of a new electric road which will enter Toledo early next spring. Traffic arrangements will be made with the Western Ohio Electric and the Ohio Electric for the entrance into this city. The new road will tap the rich country around Bluffton and Celina. The company has already opened the first section of the road for traffic between Bluffton and Geneva, and in the spring will build from Geneva to Celina. At Celina it will connect with the Western Ohio, and at Lima with the Ohio Electric for Toledo. H.

AUGUSTA, GA.—One of the biggest interurban traction deals in the south was consummated when Redmon and Company of New York took over the holdings of the E. H. Harriman estate in the stocks and bonds of the Augusta-Aiken Railway and Electric Company and allied properties. The purchase price is stated to be $2,700,000. The new owners intend to begin immediately the extension of the road from Augusta westward to Atlanta and from Aiken northward to Columbia. The completion of the project will give a continuous line between the capitals of South Carolina and Georgia, a total distance of 280 miles.

CRAWFORDSVILLE, IND.—The sale of the Indianapolis, Crawfordsville and Western Traction line, running between Indianapolis and this city, known as the Ben-Hur line, at receiver's sale, is likely to bring about a clash between the McKinley syndicate of Illinois and the McGowan syndicate of Indiana. It is said that both syndicates are laying plans to buy the property, with a view of building a line from Crawfordsville to Danville, Ill., a distance of forty-two miles. It is known that the McKinley people desire to get a line into Indianapolis and that the McGowan interests want to get connection with St. Louis, and the Ben-Hur line offers opportunities for the carrying out of either plan. S.

WASHINGTON, D. C.—The Capital Traction Company has contracted for the erection of a new power plant in the southwestern portion of the city, with a capacity of 11,000 kilowatts, and provisions for increase, at a cost of not less than $700,000. In addition to this, its barns are being reconstructed at a cost of an additional $400,000, so that the total cost of cars, power plant, and reconstruction of barns will be over $1,500,000. The company has, at the present time, all its cars in commission, except a few small and out-of-date cars. One hundred and fifty new cars have been ordered, to cost $650,000. This company has for some years past operated a merit system among its employes, and during the fiscal year ending June 30, 1910, it paid out in awards to its conductors and motormen $18,825. F.

TELEPHONE AND TELEGRAPH.

(Special Correspondence)

FORBES, MO.—The Business Men's Telephone Company has been incorporated with a capital of $3,000. P.

SIDNEY, MONT.—The telephone exchange of the Water Users' Electric Company has been destroyed by fire. P.

FORT PIERRE, S. D.—The Great Western Telephone Company is building a metallic circuit line to Rapid City. C.

REDFIELDS, S. D.—The Redfield Mutual Telephone and Switchboard Association has been incorporated. P.

VALENTINE, NEB.—The Stockgrowers' Telephone Company has been incorporated with a capital stock of $10,000. P.

SULPHUR SPRINGS, ARK.—The Sulphur Springs Telephone Company has been incorporated with a capital of $25,000. P.

ALEXANDER, N. D.—The Dakota Western Telephone Company has been organized to construct a system in McKenzie County. C.

FERGUS FALLS, MINN.—The Northwestern Telephone Exchange Company has begun the construction of its new system, P.

ROBBIN, MINN.—The Robbin Rural Telephone Company, of which Louis J. John is president, has been incorporated with a capital of $3,500. C.

ASHLAND, ORE.—The Pacific States Telephone and Telegraph Company has bought out the Midway Telephone Company operating between Ashland and Klamath Falls.

MERTYL CREEK, ORE.—The Mertyl Creek Telephone and Telegraph Company has been granted a franchise to install telephone and telegraph wires here.

YREKA, CAL.—The Cedar Park Rural Telephone Company has been granted permission to erect and maintain a telephone line along the public highway from Mayten north a distance of ten miles.

BRADY, TEX.—J. N. Paxton of Abilene has purchased the Brady Telephone Company's exchange and system from George W. Vierling for the sum of $30,000. The new owner will extend the system and make large improvements. D.

LOWELL, IND.—The directors of the Lowell Telephone Company have increased the capital stock of the company to $25,000. The officials are preparing to improve the plant, add some new equipment and extend the lines to the rural districts. Clifford O. Hill is secretary.

HOUSTON, TEX.—To satisfy a judgment rendered in federal court at Houston in favor of H. E. Huntington, April 7, 1910, the properties of the Citizens Telephone company were sold July 25, at Houston. Properties of this company consist of a local telephone exchange, franchise and telephone lines. B.

LINDEN, IND.—The Linden Co-operative Telephone Company has sold its plant and good will to T. H. and H. H. Ristine and J. K. Johnson, directors of the Home Telephone Company at Crawfordsville. The new owners announce that they will build a new exchange, extend the lines and greatly improve the system. S.

DUBLIN, GA.—A network of telephone lines is being constructed in this county to connect with the local exchange to run to Brewton, Scott, Adrian, and Rockledge. This line now supplies fifty-seven farmers. Another line is being built to Tingle, Rentz, and nearby points and will supply between thirty-five and forty farms. B.

TUCSON, ARIZ.—The federal forestry service is erecting a telephone line between Rosemond, situated near here, and De La Canoa ranch for the purpose of giving the forest-ranger stations direct connection with the headquarters here. Arrangements are being made to allow ranchers to connect with the line, giving them free telephone service into Tucson. D.

SAN MARCOS, TEX.—A group of local people have purchased the San Marcos Telephone Company and have elected the following officers: President, G. G. Johnson; secretary and treasurer, C. Johnson; directors, George W. Donaldson, G. G. Johnson, Merton Swift, I. W. Wood and D. C. Johnson. Merton Swift of Sabinal will be general manager of the system, which will be extensively improved. A flashlight system will be installed and other modern appliances put in. The new owners will take charge of the exchange on September 1. D.

GEORGETOWN, TEX.—At a meeting held at this place recently by several independent telephone companies of this territory, steps were taken to effect a merger of the rural and small exchanges of Williamson and adjoining counties. R. W. Atkinson, president of the Liberty Hill Telephone Company, and J. M. Daniels, of the Georgetown Telephone Company, are at the head of the project. It is planned to establish central offices at Georgetown, Taylor, Granger, Bartlett, Thorndale and several other larger places. More than twenty companies have signified their willingness to enter the merger. Another meeting will be held in Georgetown on August 18 to formally complete the combination and incorporate a new company to take over the smaller exchanges. D.

ELECTRICAL SECURITIES.

Although the volume of trading last week was about half the amount for the corresponding midsummer period of the three previous years, the events of the week showed signs of an increased stability and a substantial recovery from the recent declines. Prices of active stocks Saturday noon showed advances of two to four points net over the previous week, and in several issues the improvement was even more marked. Sales totaled 2,355,650 shares, comparing with 4,834,600 in the week previous, 4,901,240 in the corresponding week a year ago, 4,913,865 in 1906 and 4,402,400 in 1907. Reports of price cutting on steel products were heard, but these were denied by the officials of the United States Steel Corporation.

July gross receipts of the Massachusetts Electric Companies recorded the largest gain of any month this fiscal year, but not the largest percentage of gain. The increase in gross income was $71,200, which compares with a $12,000 decrease in June and gains of $31,600 in May, and of $53,800 in April. For the ten months the increase in gross has been $466,942.

CLOSING BID PRICE FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

NEW YORK.

	August 8.	August 1.
Allis-Chalmers common	8½	8
Allis-Chalmers preferred	27	23½
Amalgamated Copper	63⅜	61¼
American Tel. & Cable	*80	*80
American Tel. & Tel.	131¾	130¾
Brooklyn Rapid Transit	75⅜	73⅝
General Electric	141	139
Interborough-Metropolitan common	16¾	16⅜
Interborough-Metropolitan preferred	46½	44
Kings County Electric	*124	*124
Mackay Companies (Postal Telegraph and Cables) common	82½	81
Mackay Companies (Postal Telegraph and Cables) preferred	71	71
Manhattan Elevated	129	127
Metropolitan Street Railway	*18	*18
New York & New Jersey Telephone	*103	*103
U. S. Steel common	68½	66¾
U. S. Steel preferred	114⅝	115
Western Union	63	60
Westinghouse common	58	54
Westinghouse preferred	*125	*125

BOSTON.

American Tel. & Tel.	132	130¾
Edison Elec. Illuminating	*255	*255
General Electric	*139	*139
Massachusetts Electric common	15¼	14¾
Massachusetts Electric preferred		79
New England Telephone	132	*132
Western Tel. & Tel. common	*15	*15
Western Tel. & Tel. preferred	*85	*85

PHILADELPHIA.

American Railways	42	42
Electric Company of America	11¼	11¼
Electric Storage Battery common	47⅜	47¼
Electric Storage Battery preferred	*49	*49
Philadelphia Electric	14¾	14⅝
Philadelphia Rapid Transit	18⅜	17⅞
Philadelphia Traction	82½	82¾
Union Traction	43⅜	43

CHICAGO.

Chicago Railways, Series 1	65	70
Chicago Railways, Series 2	*15	15
Chicago Subway	2¼	*2¼
Chicago Telephone	115½	116
Commonwealth Edison	110¾	110
Metropolitan Elevated common	18	18½
Metropolitan Elevated preferred	60	59
National Carbon common	118	114
National Carbon preferred	118¼	115

*Last price quoted.

PERSONAL MENTION.

JOHN M. KLEIN, a member of the firm of M. Klein & Sons, Chicago, makers of construction tools, just returned from a six weeks' trip to the Pacific coast.

ALBERT E. BRADDELL, for the past two years connected with the Chicago office of the Sprague Electric Company, has been transferred to the general office of the company in New York City.

C. O. BAKER, the well-known platinum merchant, returned to New York City on August 6, after a trip to Europe with his wife. Mr. Baker spent three months at Bad Wilgunden, Germany, and comes back completely restored to health.

J. G. BIDDLE the electrical instrument dealer of Philadelphia, was a New York visitor last week, conferring with Dr. K. G. Frank, the representative in the United States for Siemens & Halske of Berlin.

HERBERT G. LOWELL, superintendent of the Gardner Electric Light Company, Gardner, Mass., has handed in his resignation, which is to take effect August 15. Mr. Lowell intends to take a similar position with a Colorado plant.

S. D. LUCAS, who has served as manager of the local exchange of the Bell Telephone Company for a long while, has given up that position and becomes special agent for the company with headquarters in Charlotte, N. C. He is succeeded by A. C. Hobson, of Pensacola, Fla.

ANDREW KIDD, JR., who for several years has been an engineer and representative of the General Electric Company, recently resigned his position. He has opened an office at 95 Liberty street, New York City, and will practice as consulting electrical and mechanical engineer.

C. J. SIMMONS, JR., general manager of the Atlanta Telephone and Telegraph Company, has made announcement of his retirement from active management of the company. Mr. Simmons will devote his time to the practice of law, although he will retain his stock in the company. His successor is A. B. Conklin.

WILLIAM J. A. BAILEY, who recently returned from a successful trip around the world representing a number of American manufacturers, is now preparing another business tour. He expects to leave this country early in the fall and will be gone about a year, visiting the leading commercial centers of the world. Mr. Bailey markets his lines in conjunction with permanent sales offices in the different countries, so that this trip would no doubt be of interest to manufacturers seeking foreign trade. His address is No. 32 Broadway, New York City.

JOHN C. RENNARD has been appointed electrical engineer of the Fire Department of New York City. Under the Commissioner's direction Mr. Rennard will supervise the construction of the new fire-alarm telegraph system, for which $3,000,000 has been appropriated. The board of Estimate provided $420,000 this year for beginning on the new system in Manhattan. Mr. Rennard is a graduate of West Point, class 1890, and served two years as an artillery officer. In 1894 he was graduated from Columbia University with the degree of electrical engineer. In 1900 he was appointed assistant to the chief engineer of the New York Telephone Company.

LEGAL NOTES.

SCHLESINGER PATENT, OWNED BY ALLIS-CHALMERS COMPANY, SUSTAINED.—In the suit of the Allis-Chalmers Company, *et. al.*, versus the Hestonville, Mantua & Fairmont Passenger Railway Company and the General Electric Company, Judge Edward G. Bradford, on July 28, handed down a decree holding that Letters Patent of the United States No. 546,049, issued to William M. Schlesinger, assignor to John J. McDuffee, trustee, of September 10, 1895, for improvements in electric railways, are good and valid in law as to the first claim thereof, which is as follows: "1—In an electric railway the combination is, a series of separate feeding conductors extending in multiple-arc relation from one generator pole or terminal to points along the line of way, safety devices for said separate feeding conductors, a working conductor comprising a series of insulated or disconnected sections disposed along the line of way and supplied by said separate feeding conductors, and return circuit connections opposed to said sections and leading to the other generator pole, or terminal, substantially as described." It is adjudged that Schlesinger is the original inventor, that the Allis-Chalmers Company is the lawful and exclusive owner of said letters patent through purchase from McDuffee, and Henry B. Robb is appointed master to take and state the account of whatever profits, gains and advantages, and assess such damages as may have accrued through the infringement of claim one of these letters patent, and a perpetual injunction is issued restraining the defendants from manufacturing, selling or using apparatus or devices containing or embodying the invention covered by claim one of said letters patent.

PROPOSALS.

ELECTRICAL SUPPLIES.—The Department of Justice, Washington, D. C., will receive sealed proposals until August 19, 1910, for furnishing and delivering at the United States penitentiary at Leavenworth, Kan., conduit, outlet boxes, etc., for electric light, telephone and clock outlets for the hospital building, in accordance with specifications. Copies of the specifications, together with further information, may be had upon application at the office of R. V. LaDow, superintendent of prisons, Washington, D. C.

NAVY DEPARTMENT SUPPLIES.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids on naval supplies on the dates given below. Bidders interested therein should make early application for copies of the schedule, giving the schedule numbers desired. Schedules can be obtained from the Navy Pay Office nearest each navy yard. Bids will be asked on the following supplies:

Date of opening.	Material.	Quantity.	Delivery at navy yard.	Schedule No.
August 16—	Buzzers, salvo firing	60	Brooklyn, N. Y.	2780
	Electrical wires and cables	Miscellaneous	Various	2768
	Electrical wires and cables	Miscellaneous	Washington, D. C.	2773
	Cells, dry, reserve type	300	Boston, Mass.	2780
	Fans, single-phase induction	100	Brooklyn, N. Y.	2770
	Tape, insulating, cotton	1,350 pounds	Brooklyn, N. Y.	2780
	Tape, insulating, cotton and rubber	1,000 pounds	Boston, Mass.	2780
	Telephones and accessories	Miscellaneous	Various	2766

NEW PUBLICATIONS.

IRON ORE DEPOSITS OF THE BRISTOL MINE.—Bulletin No. 2, issued by the Canada Department of Mines contains a complete report of the iron ore deposits of the Bristol Mine, Pontiac County, Quebec. Besides the magnetometric survey the bulletin also contains a report of the magnetic concentration of British ores.

THE PRODUCTION OF MICA IN 1908.—This bulletin issued by the Department of the Interior contains a complete review of the conditions surrounding the mica industry in this country. Figures relating to the production, importation and exportation are given, and the total value of the product for each year since 1880 is shown in a table. Ten of the states in the Union produce mica, and the principal part of the output is used for the insulation of electrical apparatus.

HANDLING LOCOMOTIVES AT TERMINALS.—The papers on this subject which were read before the joint meeting of the Institute of Mechanical Engineers and the American Society of Mechanical Engineers, by members of the latter body, have been published in booklet form. Papers contained in the publication are as follows: Handling Locomotives at Terminals, Frederick M. Whyte; Engine House Practice, F. H. Clark; American Locomotive Terminals, William Forsyth; Handling Engines, H. H. Vaughan.

THE PUBLICITY MAGAZINE.—The July issue of this magazine, published by the Under-Feed Stoker Company of America, contains among other items, an article by Sylvester S. Howell. Mr. Howell, in speaking of "Furnace Draft in Its Relation to Smoke Prevention" tells of a few things which are necessary if the combustion of volatile gases is to be accomplished. It seems a requisite to perfect and rapid combustion to create a more or less violent impact of the air with the combustible The article has in connection with its several tables and curves..

PAPERS ON ELECTRIFICATION OF RAILWAYS.—The papers on railway electrification, which were read at the joint meeting of the Institution of Mechanical Engineers and the American Society of Mechanical Engineers, have been published in the form of a booklet. The papers contained in this publication are not all those read before the meeting, but only those contributed by members of the American Society of Mechanical Engineers. They are as follows: The Electrification of Railways, George Westinghouse; Economics of Railway Electrification, Wm. Bancroft Potter; and The Electrification of Trunk Lines, L. R. Pomeroy.

INDUSTRIAL ITEMS.

THE DIELITE MANUFACTURING COMPANY, Philadelphia, Pa., announces that its factory has been removed from Stenton Avenue, near Wayne Junction, to Armat Street, corner Lena, Germantown.

THE BLAKE SIGNAL AND MANUFACTURING COMPANY, Boston, Mass., is mailing price lists of Blake insulated staples and Blake compressed cleats. These latter are designed for low-voltage circuits of interior wiring, such as telephone, telegraph, annunciator and bell work, where the circuits are run over plaster, and Blake staples cannot be used.

THE FAIRMOUNT ELECTRIC AND MANUFACTURING COMPANY, of Philadelphia, Pa., is now represented in New York State, excepting New York city, by G. E. Bennett & Company, 237 Vermont Street, Buffalo, N. Y. The company manufactures electrical specialties, comprising station pot-heads, ground clamps, conduit fittings, fixture hangers, and test connectors.

THE E. P. MORRIS ELECTRICAL SUPPLY COMPANY, Elizabethtown, Pa., recently opened its new plant for the inspection of the public and the new machinery will soon all be installed. The new shop is double the size of the old one and contains the most modern machinery. Orders which are present on the company's books will keep the new plant busy for some time.

THE WAGNER ELECTRIC MANUFACTURING COMPANY, St. Louis, Mo., has mailed to its customers bargain list No. 13, giving prices on a large assortment of new and second motors, single-phase and polyphase. The company also carries a stock of lighting and power transformers and switchboard equipment. All the apparatus which has been placed in this list is ready for immediate shipment.

EDWARD J. OBEIRNE & COMPANY, Elgin, Ill., recently received from a number of companies, letters stating how well pleased the station manager and customers were with the Deflectoliers. Some of the letters stated that the fixture was "The best on the market," others that it was "The best in the world," but all showed that the fixtures were eminently saisfactory. The company has recently sent out a price list of its product.

AGUTTER-GRISWOLD-COMPANY, Seattle, Wash., recently issued catalogue No. 105, which supersedes all previous issues and general quotations. The catalogue was compiled in order that the complete line of the company might be listed under one cover and neither time nor expense was spared in its preparation. Both paper and printing are the best and numerous illustrations of the line of apparatus are provided. The information and data is, moreover, so arranged that anything desired may be found in a very short time.

THE BOSSERT ELECTRIC CONSTRUCTION COMPANY, Utica, N. Y., has issued a perpetual catalogue listing plugged steel outlet boxes, Monitor conduit bushings, Erickson conduit insulators, flexible conduit bushings and armored conductor bushings. Attention is especially called to the plugged steel outlet boxes in connection with Erickson insulators or Monitor bushings. This is an excellent arrangement and is strictly in accordance with the underwriters' requirements. The catalogue is well illustrated throughout and contains a complete list of prices.

THE WESTERN ELECTRIC COMPANY has just issued its bulletin No. 1004, describing central battery, non-multiple switchboards with lamp signals. The switchboards presented in this publication are those which are recommended for exchanges where the ultimate number of subscribers' lines will not exceed 500 and a central battery system is required with or without magneto toll or rural line connections. The bulletin, which contains twenty pages, is illustrated with numerous diagrams and half-tones and contains considerable technical information on the points of this particular style of telephone switchboard.

PETTINGILL-ANDREWS COMPANY, Boston, Mass., publishes, as the leading article in the August issue of *Juice*, an editorial headed "In Behalf of the 'Silent Partner.'" The editor makes therein a plea for the rights of the public, which is a silent partner of any manufacturing company. The first of a series of articles on wiring tables also appears in this issue. The reception of the pamphlet of wiring data which was published by the company and was greeted with such approval by the trade, shows that such articles are most timely. An article on "The Why of the New Carbon Lamp Rating" and description of apparatus add much to the interest of the issue.

THE STONE & WEBSTER ENGINEERING CORPORATION, Boston, Mass., has been secured by the Boston & Maine Railroad for the designing and construction of a 1,200-kilowatt water-power plant at Franklin, N. H., twenty miles north of Concord. Double transmission lines along the right of way of the railroad will carry the current at 22,000 volts to three substaticns. The power will be used for the railroad shops and for lighting the yards and station. Current will also be supplied to the Concord & Manchester branch, and to the Concord Street Railway and Contoocook Park. Additional converting apparatus of 300 kilowatts' capacity, together with step-down transformers and controlling switches for a 2,300-volt lighting system, will be installed at the south end substation. Three hundred kilowatts of converter, transformer and switching equipment now mounted in the portable substation at West Concord will be removed and erected in the engine room of the steam generating station. A new substation, known as the Hooksett substation, having a capacity of 600 kilowatts, will be built to supply the Manchester branch. New step-down transformers of 500 kilowatts' capacity will be installed in the engine room of the shops. Improvements will also be made in the West Concord steam plant.

DATES AHEAD.

Michigan Electrical Association. Annual convention, Port Huron, Mich., August 16, 17 and 18.

Indiana Electric Light Association. Second annual meeting, Indianapolis, Ind., August 17 and 18.

League of American Municipalities. Annual convention, St. Paul, Minn., August 23-26.

Pacific Coast Eletrical Exposition. San Francisco, Cal., September 17 to September 24, 1910.

Northwest Electric Light and Power Association. Annual convention on board the steamship *Queen*, leaving Seattle, Wash., August 26 and returning August 29.

Telephone and Telegraph Engineers' Second International Conference. Paris, France, September 4-11.

Denver Electric Show. Colorado Electric Club, Denver, Colo., October 8-15.

American Street and Interurban Railway Association. Annual convention, Atlantic City, N. J., October 10-14.

American Society of Municipal Improvements. Annual convention, Erie, Pa., October 11-14.

Railway Signal Association. Annual meeting, Richmond, Va., October 11.

American Electrochemical Society. Eighteenth general meeting, Chicago, Ill., October 13-15.

American Association of Electric Motor Manufacturers. Semi-annual meeting, Chicago, November 14-16.

Alabama Light and Traction Association. Next meeting, Anniston, Ala., November 21-23.

International Association of Municipal Electricians. Annual convention, Rochester, N. Y., September 6-9.

Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps. Twenty-ninth annual reunion, Chicago, Ill., September 8-10.

Pennsylvania Electric Association Convention. Glen Summit Springs, Pa., September 14-16.

New England Section, National Electric Light Association. Fall convention, Pleasant Point, New London, Conn., September 13 and 14.

Colorado Electric Light, Power and Railway Association. Next convention, Glenwood Springs, Colo., September 21-22-23.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual meeting, Kansas City, Kan., September 27 and 28.

Directory of Electrical and Allied Engineering and Scientific Societies

(Published in the second issue of each month.)

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary, G. S. Emery, Mobile, Ala.

AMERICAN ASSOCIATION OF ELECTRIC MOTOR MANUFACTURERS. Secretary, W. H. Tapley, 29 West Thirty-ninth Street, New York, N. Y.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, J. W. Richards, South Bethlehem, Pa.

AMERICAN ELECTROTHERAPEUTIC ASSOCIATION. Secretary, Albert C. Geyser, 352 Willis Avenue, New York, N. Y.

AMERICAN FOUNDRYMEN'S ASSOCIATION. Secretary, Richard Moldenke, Wachtung, N. J.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, Ralph W. Pope, 29 West Thirty-ninth Street, New York, N. Y.

AMERICAN INSTITUTE OF MINING ENGINEERS. Secretary, Rossiter W. Raymond, 29 West Thirty-ninth Street, New York.

AMERICAN MATHEMATICAL SOCIETY. Secretary, F. N. Cole, 50 West One Hundred and Sixteenth Street, New York, N. Y.

AMERICAN PHYSICAL SOCIETY. Secretary, Ernest Merritt, Cornell University, Ithaca, N. Y.

AMERICAN RAILWAY MASTER MECHANIC'S ASSOCIATION. Secretary, J. W. Taylor, Old Colony Building, Chicago, Ill.

AMERICAN ROENTGEN-RAY SOCIETY. Secretary, G. C. Johnson, 514 Bijou Building, Pittsburg, Pa.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary, Edgar Marburg, University of Pennsylvania. Philadelphia, Pa.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, N. Y.

AMERICAN SOCIETY OF CIVIL ENGINEERS. Secretary, Charles Warren Hunt, 220 West Forty-seventh Street, New York, N. Y.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Secretary, A. P. Folwell, 239 West Thirty-ninth Street, New York, N. Y.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. C. Donecker, 29 West Thirty-ninth Street, New York, N. Y.

AMERICAN STREET AND INTERURBAN RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary, H. E. Weeks, Tri-City Railway Company, Davenport, Iowa.

AMERICAN STREET AND INTERURBAN RAILWAY CLAIM AGENTS' ASSOCIATION. Secretary, B. B. Davis, Columbus Railway and Light Company, Columbus, Ohio.

AMERICAN STREET AND INTERURBAN RAILWAY ENGINEERING ASSOCIATION. Secretary, J. W. Corning, Boston Elevated Railway Company, Boston, Mass.

AMERICAN STREET AND INTERURBAN RAILWAY TRANSPORTATION AND TRAFFIC ASSOCIATION. Secretary, H. C. Donecker, 29 West Thirty-ninth Street, New York, N. Y.

AMERICAN STREET AND INTERURBAN RAILWAY MANUFACTURERS' ASSOCIATION, Secretary, George R. Keegan, 2321 Park Row Building, New York, N. Y.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary, J. E. Cowles, Hot Springs Light and Railway Company, Hot Springs, Ark.

ARKANSAS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Charles F. Speed, Texarkana, Ark.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, N. T., Wilcox, Lowell, Mass.

ASSOCIATION OF EDISON PURCHASING AGENTS. Secretary, H. F. Frassee, Edison Electric Illuminating Company, Brooklyn, N. Y.

ASSOCIATION OF ELECTRIC LIGHTING ENGINEERS OF NEW ENGLAND. Secretary, W. H. Cole, Waltham, Mass.

ASSOCIATION OF ENGINEERING SOCIETIES. Secretary, Fred Brooks, 31 Mills Street, Boston, Mass.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, G. H. Winslow, Perry-Payne Building, Cleveland, Ohio.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary, G. B. Colgrove, Illinois Central Railroad, Chicago, Ill.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, Minnesota, St. Paul & Sault Ste. Marie Railroad, Chicago, Ill.

CALIFORNIA ELECTRIC RAILWAY ASSOCIATION. Secretary, L. E. W. Pioda, Oak and Broderick Streets, San Francisco, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Secretary, T. S. Young, Confederation Life Building, Toronto, Canada.

CANADIAN STREET RAILWAY ASSOCIATION. Secretary, Acton Burrows, 157 Bay Street, Toronto, Canada.

CENTRAL ELECTRIC RAILWAY ASSOCIATION. Secretary, A. L. Neereamer, Traction Terminal Building, Indianapolis, Ind.

CENTRAL ELECTRIC TRAFFIC ASSOCIATION. Secretary, J. T. Brittson, Chicago, South Bend & Northern Indiana Railway Company, South Bend, Ind.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary, J. C. Lawler, Colorado Springs, Colo.

CONNECTICUT STATE STREET RAILWAY ASSOCIATION. Secretary, F. W. Poole, Bridgeport, Conn.

ELECTRICAL CONTRACTORS' ASSOCIATION OF INDIANA. Secretary, George Skillman, Indianapolis, Ind.

ELECTRIC CLUB OF CHICAGO. Secretary, F. S. Hickok, Marquette Building, Chicago, Ill.

ELECTRICAL CLUB OF CALIFORNIA. Secretary, Russell D. Holabird, Argonaut Hotel, San Francisco, Cal.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, George William Russell, Jr., 25 West Forty-second Street, New York, N. Y.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, Ernest S. Cowle, 1613 Grand Avenue, Kansas City, Mo.

ELECTRICAL CREDIT ASSOCIATION OF CANADA, LIMITED. Secretary, William R. Staveley, Royal Insurance Building, Montreal, Canada.

ELECTRICAL CREDIT ASSOCIATION OF CHICAGO. Secretary, Frederick P. Vose, 1343 Marquette Building, Chicago, Ill.

ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA. Secretary, John W. Crum, 1324 Land Title Building, Philadelphia, Pa.

ELECTRICAL CREDIT ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, San Francisco, Cal.

ELECTRICAL CREDIT SOCIETY OF NEW YORK. Secretary, Franz Neilson, 80 Wall Street, New York, N. Y.

ELECTRIC VEHICLE AND CENTRAL STATION ASSOCIATION. Secretary, H. T. Sands, 139 Pleasant Street, Malden, Mass.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West Thirty-ninth Street, New York,

ENGINEERS' CLUB OF PHILADELPHIA. Secretary, W. P. Taylor, Philadelphia, Pa.

ENGINEERS' SOCIETY OF MILWAUKEE. Secretary, R. H. Pinkley, Plankinton House, Milwaukee, Wis.

ENGINEERING SOCIETY OF WISCONSIN. Secretary, W. G. Kerchoffer, 32 Vroman Building, Madison, Wis.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA. Secretary, Elmer K. Hiles, 2511 Oliver Building, Pittsburg, Pa.

FLORIDA ELECTRIC LIGHT AND POWER ASSOCIATION. Secretary, H. C. Adams, West Palm Beach, Fla.

FRANKLIN INSTITUTE. Secretary, R. B. Owens, 15 South Seventh Street, Philadelphia, Pa.

ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. N. Bloomenthal, Chicago, Ill.

ILLINOIS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, C. A. Camp, Henry, Ill.

ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, H. E. Chubbuck, Mayer Building, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. Secretary, Preston S. Millar, Engineering Societies Building, 33 West Thirty-ninth Street, New York, N. Y.

INDEPENDENT TELEPHONE ASSOCIATION OF MISSISSIPPI. Secretary and treasurer, J. B. Shannon, New Albany, Miss.

INDEPENDENT TELEPHONE ASSOCIATION OF TEXAS AND LOUISIANA. Secretary, C. A. Shock, Sherman, Tex.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, J. V. Zartman, Indianapolis, Ind.

INDIANA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Walter J. Uhl, Logansport, Ind.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, Frank P. Foster, Corning, N. Y.

IOWA ELECTRICAL ASSOCIATION. Secretary, W. N. Keiser, Des Moines, Iowa.

IOWA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, W. J. Thill, Des Moines, Iowa.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, George M. McCartney, Des Moines, Iowa.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary, James D. Nicholson, Newton, Kan.

KENTUCKY INDEPENDENT TELEPHONE ASSOCIATION. Secretary, W. G. Turpin, Henderson, Ky.

MAINE ELECTRIC ASSOCIATION. Secretary, F. D. Gordon, Lewiston, Me.

MAINE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, M. E. Crow, Houlton, Me.

MASSACHUSETTS STREET RAILWAY ASSOCIATION. Secretary, Charles S. Clark, 70 Kilby Street, Boston, Mass.

MASTER CAR BUILDERS' ASSOCIATION. Secretary, J. W. Taylor, 390 Old Colony Building, Chicago, Ill.
MICHIGAN ELECTRIC ASSOCIATION. Secretary and treasurer, A. P. Biggs, Detroit, Mich.
MICHIGAN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, A. A. Burch, Battle Creek, Mich.
MINNESOTA ELECTRICAL ASSOCIATION. Secretary-treasurer, T. C. Gordon, Little Falls, Minn.
MISSISSIPPI ELECTRICAL ASSOCIATION. Secretary, J. Abbott, Jackson Electric Railway, Light and Power Company, Jackson, Miss.
MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary, N. J. Cunningham, Springfield, Mo.
MISSOURI INDEPENDENT TELEPHONE ASSOCIATION. Secretary, George W. Schwerer, Windsor, Mo.
MUNICIPAL LIGHTING ASSOCIATION OF MASSACHUSETTS. Secretary, J. C. Norcross, Reading, Mass.
NATIONAL ACADEMY OF SCIENCES. Secretary, Arnold Hague, United States Geological Survey, Washington, D. C.
NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.
NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.
NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, N. H. Morton, 41 Martin Building, Utica, N. Y.
NATIONAL ELECTRIC CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago, Ill.
NATIONAL ELECTRICAL INSPECTORS' ASSOCIATION. Secretary, T. H. Day, 27 Pliny Street, Hartford, Conn.
NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary, T. C. Martin, 33 West Thirty-ninth Street, New York, N. Y.
NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. B. Ware, Monadnock Block, Chicago, Ill.
NEBRASKA ASSOCIATION OF INDEPENDENT TELEPHONE COMPANIES. Secretary, Charles H. Hood, Lincoln, Neb.
NEBRASKA ELECTRICAL ASSOCIATION. Secretary, Frank McMaster, Beatrice, Neb.
NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Alton F. Tupper, 84 State Street, Boston, Mass.
NEW ENGLAND SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary, L. D. Gibbs, 39 Boylston Street, Boston, Mass.
NEW ENGLAND STREET RAILWAY CLUB. Secretary, John J. Lane, 12 Pearl Street, Boston, Mass.
NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, Engineering Societies Building, 29 West Thirty-ninth Street, New York, N. Y.
NEW YORK RAILROAD CLUB. Secretary, H. D. Vote, 95 Liberty Street, New York, N. Y.
NEW YORK STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, R. Max Eaton, Niagara Falls, N. Y.
NORTH DAKOTA INDEPENDENT TELEPHONE ASSOCIATION. Secretary and treasurer, L. C. Lane, Kensal, N. D.
NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION. Secretary, N. W. Brockett, Cataract Building, Seattle, Wash.
OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.
OHIO INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Ralph Reamer, Columbus, Ohio.
OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, F. E. Sanborn, Ohio State University, Columbus, Ohio.
OKLAHOMA ELECTRIC LIGHT, RAILWAY AND GAS ASSOCIATION. Secretary, Galen Crow, Guthrie, Okla.
OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION. Secretary, Frank J. Sherrer, 195 Broadway, New York, N. Y.
ORDER OF THE REJUVENATED SONS OF JOVE. Mercury, Roy M. Van Vliet, Monadnock Block, Chicago, Ill.
PACIFIC COAST ELECTRIC VEHICLE ASSOCIATION. Secretary, A. H. Halloran, 901 Atlas Building, San Francisco, Cal.
PENNSYLVANIA ELECTRIC ASSOCIATION. Secretary, Van Dusen Rickert, Pottsville, Pa.
PENNSYLVANIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, H. E. Bradley, 135 South Second Street, Philadelphia, Pa.
PENNSYLVANIA STATE STREET RAILWAY ASSOCIATION. Secretary, Charles H. Smith, Lebanon, Pa.
PIKE'S PEAK POLYTECHNIC SOCIETY. Secretary, E. A. Sawyer, Colorado Springs, Colo.
PITTSBURG ELECTRIC BOOSTERS' CLUB. Recording Wattmeter, O. R. Rombach, 919 Liberty Avenue, Pittsburg, Pa.
RAILWAY SIGNAL ASSOCIATION. Secretary, C. C. Rosenberg, Bethlehem, Pa.
SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS. Secretary, David H. Bates, 658 Broadway, New York, N. Y.
SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, H. H. Norris, Cornell University, Ithaca, N. Y.
SOCIETY OF AUTOMOBILE ENGINEERS. Secretary, Alexander Churchward, 30 Church Street, New York, N. Y.
SOCIETY OF WIRELESS TELEGRAPH ENGINEERS. Secretary, E. D. Forbes, Box 63, Brant Park, Mass.
SOUTH DAKOTA INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. R. Buck, Hudson, S. D.
SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, W. B. Head, Stephensville, Tex.
STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK Secretary, J. H. Pardee, J. G. White & Company, New York, N. Y.
TELEPHONE SOCIETY OF NEW YORK. Secretary, T. H. Lawrence, Eighteenth Street and Irving Place, New York, N. Y.
TEXAS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, T. A. Gould, Ennis, Tex.
UNDERWRITERS' NATIONAL ELECTRIC ASSOCIATION. Secretary Electrical Committee, C. M. Goddard, 141 Milk Street, Boston, Mass.
VERMONT AND NEW HAMPSHIRE INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. B. Seeley, St. Johnsbury, Vt.
VERMONT ELECTRICAL ASSOCIATION. Secretary, A. B. Marsden, Manchester, Vt.
WASHINGTON SOCIETY OF ENGINEERS. John C. Hoyt, 1314 F Street, Washington, D. C.
WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 125 Monroe Street, Chicago, Ill.
WESTERN SOCIETY OF ENGINEERS. Secretary, J. H. Warder, Monadnock Block, Chicago, Ill.
WISCONSIN ELECTRICAL ASSOCIATION. Secretary, John S. Allen, Lake Geneva, Wis.
WISCONSIN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. C. Crowley, Jr., Superior, Wis.
WISCONSIN STATE TELEPHONE ASSOCIATION. Secretary, Paul J. Weirich, Monroe, Wis.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) August 2, 1910.

965,853. ELECTRIC-LAMP FITTING. Rene Joseph Francois Samuel Baron, Paris, France. Filed Jan. 17, 1907. A ceiling fixture includes means for unwinding a cable and securing it at desired positions.

965,876. TELEPHONE SYSTEM. Oliver C. Dennis, Chicago, Ill. Filed Oct. 29, 1904. A line switch is operated when a subscriber makes a call, and a cut-out switch is operated when the exchange operator makes a connection with a substation in response to a call.

965,877. RELAY. Oliver C. Dennis, Chicago, Ill. Original application filed Oct. 29, 1904. Divided and this application filed Dec. 11, 1905. A selective solenoidal relay.

965,884. APPARATUS FOR STRENGTHENING ELECTRIC VIBRATIONS. Simon Eisenstein, Kief, Russia. Filed Mar. 27, 1908. The arrangement for increasing the vibrations of Duddell connections comprises a variable resistance placed in the circuit in series with the arc of the Duddell connections and adapted to automatically increase in resistance as the current in said circuit decreases, and an auxiliary vibratory circuit shunted around the resistance and the arc and consisting of self-induction and a capacity placed in series with each other in such a manner that they reinforce the current fluctuations without exerting any influence on the vibration of the generator, the frequency of the shunting auxiliary circuit being in harmony with the frequency of the main vibration circuit.

965,900. ELECTRODE FOR VAPOR-LAMPS. Peter Cooper Hewitt, New York, N. Y., assignor to Cooper Hewitt Electric Company, New York, N. Y. Filed Apr. 16, 1904. An electrode for mercury-vapor apparatus, consists of an amalgam formed of one part lead, one part tin, and four parts mercury.

965,925. ROTOR OF DYNAMO-ELECTRIC MACHINES. Robert Stafford McLeod, Didsbury, near Manchester, England. Filed June 15, 1909. An induction motor comprises conductor bars each consisting of two parts separated at the ends, a plurality of end connectors each consisting of a ring provided with a series of lugs, each of the lugs being twisted so that its plane is at right angles to the plane of the ring, the adjacent lugs of the several rings being held between the two parts of the corresponding connector bar.

965,928. MACHINE FOR COVERING OR INSULATING WIRE WITH YARN OR ITS EQUIVALENT. Donald Noble, Bridgeport, Conn. Filed Mar. 31, 1908. A machine for covering wire with

yarn or its equivalent, comprises covering mechanism and feeding mechanism, a rotary idle disk interposed between the mechanisms around the periphery of which disk the covered wire extends, and means for effecting planetary adjustments of the disk.

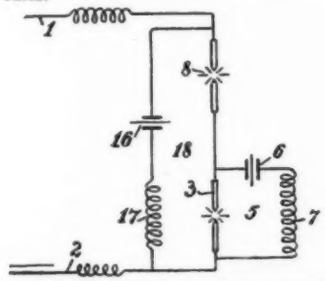
965,973. TELEPHONE TRUNK-CIRCUIT. Charles S. Winston, Chicago, Ill., assignor to Kellogg Switchboard & Supply Company, Chicago, Ill. Filed Dec. 24, 1904. A supervisory signal is placed in condition to operate by current over the two limbs of the trunk in series individual to the trunk at the outgoing end to indicate the position of the subscriber's telephone of the line connected with the other end of the trunk.

965-976. TELEPHONE-EXCHANGE SYSTEM. Joseph Lane Wright, Washington, D. C., assignor to the North Electric Company, Cleveland, O. Filed April 12, 1906. A controlling apparatus for an automatic switching apparatus used for interconnecting the lines of a telephone system, is described in detail.

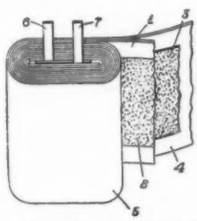
965,992. ELECTRICAL-CONDENSER. William W. Dean, Elyria, Ohio, assignor to the Dean Electric Company, Elyria, Ohio. Filed Jan. 28, 1909. The condenser comprises a strip of paper coated on one side with finely divided conducting material, a strip of lower-resistance metallic foil, the finely divided conducting material adapted to be dissipated at temperatures at which the foil is undisturbed, the two wound together in the form of a roll with the paper between the metallic surfaces and terminals for each conductor.

966,001. SUPPORT FOR THIRD RAILS. Levi W. Fox, Norvell, Mich., assignor of one-third to C. E. West and one-third to G. W. Fox, Jackson County, Mich. Filed Apr. 12, 1909. A rail-supporting clamp.

966,013. TELEPHONE-EXCHANGE SYSTEM. Charles E. Hague, Rochester, N. Y., assignor to Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Filed Apr. 24, 1907. Utilizes an interconnected system of four relays and their circuits.



965,884.—APPARATUS FOR STRENGTHENING ELECTRIC VIBRATIONS.



965,992.—ELECTRICAL CONDENSER.

966,026. COMBINED BOX AND SOCKET FOR ELECTRIC LAMPS. Harry Wallace Lawrence, Denver, Colo. Filed Jan. 17, 1910. A combined wall and ceiling box and electric-lamp socket.

966,033. ELECTRIC ACCUMULATOR. Leon Marseille, Paris, and Paul Gouin, Levallois-Perret, France. Original application filed July 1, 1909. Divided and this application filed Mar. 28, 1910. An accumulator electrode comprises a perforated metal cylinder for the reception of an active material, a coil of wire surrounding the cylinder and reinforcing the same, and a deposit of nickel sesquioxide filling the perforations and cementing the wire to the cylinder.

966,034. IGNITION-TIMBER FOR INTERNAL-COMBUSTION ENGINES. Francis C. Mason, Grand Rapids, Mich. Filed June 19, 1909. A transversely movable plug (pressed outward by a spring) in a rotating part has projecting from it a roller which makes the contacts.

966,038. CLOCK. Frank W. Moore, Austin, Ill. Filed May 22, 1909. Comprises a gear-train, a gravity-impelled actuating-arm therefor an electromagnet, a swinging armature, an independently-swinging armature-actuated member, and a link connecting this member to the arm.

966,086. INSTALLATION OF ELECTRIC CONDUCTORS. Edward Hall Faile, New York, N. Y. Filed Apr. 25, 1910. An improvement in the art of building construction consists in incorporating within the wall of a building a tubular protecting casing for the electric conductors, placing at the terminal of this casing a position indicator and applying a wall covering to conceal the casing and to leave exposed a portion of the indicator of smaller cross-sectional area than the casing.

966,102. INSULATING-SUPPORT FOR OVERHEAD ELECTRIC-RAILWAY CONDUCTORS. Willard H. Kempton, Hartford, Conn., assignor to The Johns-Pratt Company, Hartford, Conn. Filed July 23, 1909. An overhead supporting and section insulating structure for electric-railway conductors.

966,118. TIME-SWITCH. Willeston C. Pugh, Seattle, Wash., assignor of one-half to August Gamblee, Seattle, Wash. Filed Sept. 4, 1909. An electric switch includes terminals, a normally open switch closure, a cam, clockwork, driving connection between the cam and the clockwork, a spring, a member actuated by the spring and co-operating with the cam to cause the closure to become operative and also serving to maintain the closure in such operative condition for a predeterminately variable time.

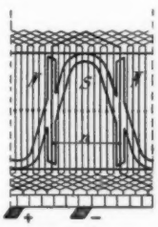
966,139. CIRCUIT-CLOSING PLUG FOR ELECTRICAL CIRCUITS. Chester H. Thodarson, Chicago, Ill. Filed Apr. 9, 1910. A circuit-closing plug comprises a body and an expansible and collapsible sleeve thereon for interlocking engagement with a socket, combined with a locking ring for locking the sleeve expanded and a spring to hold the latter in its locking position.

966,146. TESTING DEVICE FOR SPARK-PLUGS. Harvey R. Willard, Chicago, Ill. Filed May 6, 1909. A testing device for spark-plugs embraces a casing affording a small interior chamber, into which the sparking end of a spark plug may be threaded, means admitting pressure into the chamber, and a threaded stem adapted to engage in the plug aperture in the cylinder.

966,176. FASTENING MEANS. Robert M. Dixon, East Orange, N. J., assignor to Safety Car Heating & Lighting Company. Filed Aug. 29, 1907. An incandescent-lamp holder and shade.

966,203. VAPOR-LAMP WITH CONCENTRATED RADIATION. Peter Cooper Hewitt, New York, N. Y., assignor to Cooper Hewitt Electric Company. Filed Mar. 19, 1903. In combination with a vapor lamp the tube of which is arranged in an S-shape and its terminals extending upward, is a reflector, and a hood or cover is carried by the reflector and receives the upwardly turned ends of the tube.

966,204. INDUCTION-LAMP. Peter Cooper Hewitt, New York, N. Y., assignor to Cooper Hewitt Electric Company, New York, N. Y. Filed July 20, 1904. The method of producing light in a rarefied gas or vapor within a chamber, consists in exciting the gas to luminosity by passing rapidly varying currents through a primary in contact with a body thereof, these currents being of such quantity and such rate of variation as to electromagnetically induce in the vapor, currents whose electromotive force is above a critical minimum.



966,246.—ALTERNATING AND CONTINUOUS-CURRENT GENERATOR.

966,205. APPARATUS FOR TRANSFORMING ELECTRICAL ENERGY. Peter Cooper Hewitt, New York, N. Y., assignor to Cooper Hewitt Electric Company, New York, N. Y. Filed Oct. 9, 1905. A symmetrical discharge device comprises an evacuated inclosure, pairs of electrodes in opposite ends thereof and independent circuits maintaining continuous-current flow across each pair of electrodes, in combination with a pair of reversely connected unidirectional discharge devices in each of the leads from the source of current.

966,207. ELECTRIC SWITCH. Harry R. Hirst, New Bedford, Mass., assignor to Charles S. Knowles, New Bedford, Mass. Filed Feb. 15, 1909. A simple double pushbutton switch.

966,215. SHADE FOR INCANDESCENT LAMPS. Alva D. Jones, Louisville, Ky., assignor to Edmund H. Noyes, Boston, Mass. Filed Mar. 17, 1910. The shade is adapted to cover only one side of the lamp; yielding means rigid with the shade extend from near its center; and curved claws rigid with the yielding means are adapted to contact with the glass globe of the lamp at diametrically opposite points on its largest circumference.

966,217. ELECTRIC DRILL. Frederick W. King, Cleveland, Ohio. Filed Dec. 15, 1909. A normally open switch is automatically closed to operate the motor when the tool is applied to the work.

966,224. TEMPERATURE-INDICATING SYSTEM. George W. Levengood, Lebanon, Pa. Filed Aug. 27, 1909. Comprises a central station, a source of direct current, and a source of alternating current, at the central station, a thermostatic device provided with a magnet, means for connecting the magnet with the source of alternating current, said means also operating to cut off the alternating current and to connect the direct current for causing the operation of the thermostat at any predetermined temperature, a relay in circuit with the thermostat, and a local circuit controlled by the relay, and provided with a signal for indicating the operation of the thermostat.

966,239. ELECTRIC-LAMP SOCKET. Johann G. Peterson, Hartford, Conn., assignor to Arrow Electric Company, Hartford, Conn. Filed May 13, 1910. Comprises a shell, a cap with skirt fitting telescopically over the shell, a sharp-edged ring secured

within the skirt and means on the shell engaging over the sharp edge of the ring to prevent endwise separation of the parts.

966,240. ELECTRIC-LAMP SOCKET. Johann G. Peterson, Hartford, Conn., assignor to the Arrow Electric Company, Hartford, Conn. Filed May 27, 1910. A modification of the above.

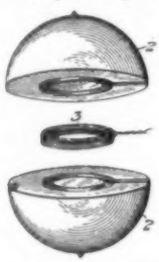
966,246. DYNAMO-ELECTRIC MACHINE FOR THE PRODUCTION OF CONTINUOUS AND ALTERNATING CURRENTS. Jakob Schurch, Bruchsal, Germany. Filed May 15, 1908. Each pole-piece has a base of considerable length in a direction corresponding with the rotation of the armature and the peripheral edges of which pole-pieces are inclined and meet at an apex, the arrangement being such that each extends toward the space included between the edges of two other pole-pieces of opposite polarity, and two successive portions of the periphery of each of said pole-pieces being offset relatively to one another and in a direction corresponding with the rotation.

966,247. TELEPHONE RECEIVER. Edward Schwartz, Antwerp, Belgium, assignor of one-third to Edward E. Clement, Washington, D. C. Filed Apr. 20, 1907. Comprises a continuous integral thin metallic shell having a flared end, a reinforcing ring secured to the flared end, a metallic cap, and a ring connected with the cap so that it will engage with the reinforcing ring on the shell, means to secure the rings and thereby the shell and cap together, insulating material molded over the shell, and an insulating coating for the cap.

966,252. ELECTRIC SWITCH. John F. Smiley, Louisville, Ky. Filed Apr. 27, 1910. A switchboard for an electric score board comprises a number of main switch arms and adjustable extensions carrying contact shoes slidably mounted thereon.

966,255. TROLLEY. Samuel H. Smith, Pittsburg, Pa. Filed Mar. 14, 1910. A special type of harp is described.

966,267. ILLUMINATED SIGN. John Swensson, New York, N. Y. Filed Sept. 22, 1909. The sign comprises a casing having a plurality of predeterminedly arranged lenses therein, means for



966,204.—INDUCTION LAMP.

illuminating the casing interiorly, and revolving ring having openings therein for intermittently permitting light to pass through the lenses.

966,286. ELECTRIC SWITCH. Joseph Henderson Wright, North Fort Worth, Tex., assignor of one-fourth to T. G. Dean, North Fort Worth, Tex. Filed Mar. 6, 1909. Comprises a rotatable shaft, an arm fixed upon a plurality of loose arms, means carried by each arm for engaging and moving an adjacent arm, a casing concentric with the shaft and inclosing the arms, and a plurality of binding posts carried by the casing, the inner ends of said binding posts forming contract plates for the arms, a portion of the binding posts being included in an electric circuit, the same forming a part of a lock the combination of which is changed by changing the binding posts included at one time in the circuit.

966,301. TROLLEY SAFETY LOCK. James L. Blair, Butler, Pa. Filed July 2, 1909. Includes a pair of spring-pressed fender jaws, etc.

966,311. FASTENING DEVICE FOR INSULATORS. Walter G. Clark, New York, N. Y., assignor to Clark Electric and Manufacturing Company, New York, N. Y. Filed July 27, 1906. Renewed May 13, 1910. The insulator has a wire receiving slot with a restricted intake, shims fitting around the wire and projecting beyond the insulator, and clamps fitting around the ends of the shims, and also around the wire.

966,328. LAMPLIGHTER. Clifton A. Hacker, Fairhaven, Mass. Filed Feb. 11, 1909. An electric battery and spark coil are included in the lamp base, and co-operate with spark points at the wick.

966,355. LAMP-SOCKET. Clarence D. Platt, Bridgeport, Conn. Filed May 31, 1910. Have an interior groove, the walls thereof projecting inwardly and a body part adapted to fit the shell and provided with a lug projecting within the groove.

966,360. CIRCUIT-BREAKER. William E. Richards, Portage, Pa. Filed Mar. 5, 1910, includes a pivoted knife, etc.

966,361. RECORDING-TARGET. Sydney Aston Mersey Rose, Richmond, near Melbourne, Victoria, Australia. Filed Aug. 3, 1908. There are electrical means for indicating with permanent marks on a replica of the target places, where bullets strike the target.

966,368. ROTARY SNAP-SWITCH. George B. Thomas, Bridgeport, Conn. assignor to The Perkins Electric Switch Manufacturing Company, Bridgeport, Conn. Filed Feb. 14, 1908. Has a rotary switch-blade carrier in two parts, one loosely mounted on the other, whereby the blade is self-adjusting.

966,382. ELECTRIC WELDING APPARATUS. Alvin E. Buchenburg, Toledo, Ohio, assignor to The Toledo Electric Welder Company, Cincinnati, Ohio. Filed Sept. 25, 1905. In combination with a set of clamping dies for gripping opposed sides of a work piece, are carrying parts for such dies mounted for reciprocatory movements together and relative to each other.

966,400. TEST-COUPLING FOR ELECTRIC CONDUCTORS. Patrick J. McDonald, Rochester, N. Y., assignor of one-half to George H. Smith, Rochester, N. Y. Filed June 20, 1908. Renewed Jan. 5, 1910. In combination with a pair of conductor sections, having flanges secured to their adjacent ends, is an insulating base having a pair of bores and a chamber communicating with the bores, with packing rings surrounding the pair of bores, means for clamping the flanges against the rings, a removable closure for the vertical chamber, and means for making and breaking electrical connection between the ends of the sections.

PATENTS THAT HAVE EXPIRED.

Following is a list of the electrical patents (issued by the United States Patent Office) that expired August 8, 1910:

502,695. SYNCHRONISM-INDICATOR. Louis Bell, Boston, Mass.
502,702. ELECTRIC-LIGHTING SYSTEM. Cummings C. Chesney, Pittsfield, Mass.
502,753. ELECTRIC BODY-GEAR. William H. Payne, Philadelphia, Pa.
502,768. TEST-CIRCUIT FOR MULTIPLE SWITCHBOARDS. Charles E. Scribner, Chicago, Ill.
502,769. LOCK-SWITCH FOR ELECTRIC SWITCHBOARDS. Charles E. Scribner, Chicago, Ill.
502,770. TELEPHONE-EXCHANGE APPARATUS. Charles E. Scribner, Chicago, Ill.
502,771. TRANSFER SYSTEM FOR SWITCHBOARDS. Charles E. Scribner, Chicago, Ill.
502,772. TEST SIGNAL FOR MULTIPLE SWITCHBOARDS. Charles E. Scribner, Chicago, Ill.
502,773. TESTING SYSTEM FOR MULTIPLE SWITCHBOARDS. Charles E. Scribner, Chicago, Ill.
502,774. TEST-CIRCUIT FOR MULTIPLE SWITCHBOARDS. Charles E. Scribner, Chicago, Ill.
502,775. TESTING APPARATUS FOR MULTIPLE SWITCHBOARDS. Charles E. Scribner, Chicago, Ill.
502,776. ELECTRIC BELT. Jean H. St. Cheverell, Jefferson, Ohio.
502,777. ALTERNATING ELECTRIC-CURRENT GENERATOR. Samuel Sheldon and John J. Rooney, Brooklyn, N. Y.
502,788. REGULATOR FOR ELECTRIC GENERATORS. Elihu Thomson, Swampscott, Mass.
502,804. ELECTRIC BELT. Duane P. Andrus, St. Louis, Mo.
502,811. ELECTRIC ALARM-CLOCK. William H. Deane, Brooklyn, N. Y.
502,821. SUBWAY FOR ELECTRIC-RAILWAY CONDUCTORS. Isaac La Rue Johnson, Washington, D. C.
502,824. SECONDARY BATTERY. Lansing Moore, Brooklyn, N. Y.
502,825. ELECTRIC SWITCH. Lansing Morse, Brooklyn, N. Y.
502,842. ELECTRIC-RAILWAY CONDUIT. Robert R. Zell, Baltimore, Md.
502,858. SUPPLY SYSTEM FOR ELECTRIC RAILWAYS. Wilton F. Jenkins, Richmond, Va.
502,889. CIRCUIT TESTING APPARATUS. Fred S. Palmer, Boston, Mass.
502,935. SELF-WINDING ELECTRIC CLOCK. Frederick M. Schmidt, Brooklyn, N. Y.
502,948. ELECTRIC-ARC LAMP. Luther H. Buchanan, Pasadena, Cal.
502,965. ELECTRODE FOR FIRING EXPLOSIVES. Joseph N. Harrison and Henry J. Harrison, San Francisco, Cal.
502,981. ELECTRICALLY OPERATED HYDRAULIC ELEVATOR. Elias Marshall, Boston, Mass.
502,983. ELECTRIC SWITCH. Joseph H. McEvoy, Waterbury, Conn.
503,016. ELECTRIC IGNITING DEVICE FOR GAS-ENGINES. Frank E. Tremper, New York, N. Y.
503,038. REGULATION OF ALTERNATING-CURRENT MOTORS. Michael von Dolivo-Dobrowolsky, Berlin, Germany.
503,076. APPARATUS FOR THE ELECTROLYTIC MANUFACTURE OF TUBES. Alexander S. Elmore, Leeds, England.
503,099. MULTIPLE SWITCHBOARD SYSTEM. Charles E. Scribner, Chicago, Ill.
503,100. ELECTRICAL RAILWAY SIGNAL. Benjamin C. Seaton, Nashville, Tenn.
503,101. ELECTRIC RAIL-BOND. Benjamin C. Seaton, Nashville, Tenn.
503,106. ARMATURE FOR DYNAMO-ELECTRIC MACHINES AND MOTORS. Schuyler S. Wheeler, New York, N. Y.
503,108. INCANDESCENT ELECTRIC LAMP. James H. Bates, Hoboken, N. Y.